

PERSONAL COMPUTER SOFTWARE

MARKETING OPPORTUNITIES

INPUT



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INPUT provides planning information, analysis, and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions.

Continuous-information advisory services, proprietary research/consulting, merger/acquisition assistance, and multiclient studies are provided to users and vendors of information systems and services (software, processing services, turnkey systems, systems integration, professional services, communications, systems/software maintenance and support).

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## INPUT OFFICES

### North America

#### Headquarters

1280 Villa Street  
Mountain View, CA 94041  
(415) 961-3300  
Telex 171407 Fax (415) 961-3966

#### New York

Parsippany Place Corp. Center  
Suite 201  
959 Route 46 East  
Parsippany, NJ 07054  
(201) 299-6999  
Telex 134630 Fax (201) 263-8341

#### Washington, D.C.

8298 C, Old Courthouse Rd.  
Vienna, VA 22180  
(703) 847-6870 Fax (703) 847-6872

### International

#### Europe

##### INPUT LTD.

41 Dover Street  
London W1X 3RB, England  
01-493-9335  
Telex 27113 Fax 01-629-0179

##### INPUT s.a.r.l.

29, Leningrad  
Paris 8, France  
42-93-60-50  
Telex 2064 70 Fax 45-22-62-23

#### Japan

FKI, Future Knowledge Institute  
Saida Building,  
4-6, Kanda Sakuma-cho  
Chiyoda-ku,  
Tokyo 101, Japan  
03-864-4026 Fax 001-03-864-4114

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DATE  
LOANED

BORROWER'S NAME

1/2 Mike D

8/30/88 Doug B





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## I INTRODUCTION



## I INTRODUCTION

- The purpose of this report is to identify areas of business where the personal computer affects the computer services market. It will also provide an overview of hardware and software market opportunities.
- The scope of this report will include hardware user expenditures and computer services user expenditures, and it will cover the world market as well as the U.S. market. The U.S. market will be covered in much more detail than the world market.
- The research for this study was conducted from March through September, 1982.
- The research involved extensive interviews of end users of personal computers and also vendors of personal computer equipment and software.
  - Several interview programs were conducted for this research.
  - Two different surveys of end users were employed.
- The first survey conducted in March and April of this year was of 32 companies.
  - These companies covered a broad range of type from very small business to Fortune 500 companies.



- Most of the user respondent data reported in this study is based on those interviews.
- A subsequent survey of end users conducted in August and September of this year covered 123 respondents in Fortune 500/50-type companies.
  - In this survey, many of the respondents were from the same company.
  - The purpose of the second survey was to identify specifically how the personal computer was being utilized in large businesses.
- Two interview programs were also conducted with vendors.
  - The first interview program included 18 vendors and used telephone as well as on-site interviews. Much of the analysis on distribution channels and marketing issues is based on these interviews.
  - Another survey was also conducted with 100 software vendors. The purpose of this survey was to analyze the type and amount of software that these vendors were selling to end users. These 100 vendors were the largest vendors of software in the U.S. marketplace. Data gathered on their personal computer software market activities was used in conjunction with the end user interviews to produce market estimates and forecasts.
- In addition to the broad interview program outlined above, extensive research was conducted using INPUT's library resources. INPUT maintains files of information on hundreds of companies operating in the personal computer marketplace. Much of this data was reviewed in depth in order to assess the technological and environmental changes currently affecting the market and to project how they are likely to affect markets in the future.

- The research for this study also drew upon market research which INPUT has been conducting on the personal computer marketplace over the past several years.
  - INPUT has studied the marketplace from the end user's perspective in its Information Systems Program which is oriented towards large EDP shop management.
  - INPUT has also studied the personal computer from the perspective of field service and field engineering management in terms of servicing and supporting the installed equipment. Field service studies of the personal computer have been conducted by INPUT in both Europe and the U.S.
  - Within the Information Services Industry Program, research conducted and compiled in INPUT's Directory of Leading Computer Services Firms in 1982 added invaluable data to the research base on the personal computer market.
- The research was also supplemented on a less formal basis by extensive contacts with experts and key vendors in the industry.
- In summary, the market estimates and forecasts draw upon well over 1,000 interviews conducted within the past year, 30% of which were with end users of the equipment.
- The personal computer is defined as a piece of equipment that is programmable by the user and sells for \$500 to \$15,000 for the complete unit.
  - The minimum unit will include a central processing unit, of no less than 16K but more frequently at least 48K of RAM memory, a keyboard, and a cathode ray tube for displaying information.

- Although not required to meet this definition, a typical system will also include one or more peripheral memory devices, such as floppy disk drives. Also not required but typical will be at least one printer, usually of a dot matrix variety.
- This definition in some ways limits what is considered to be a personal computer and in other ways expands it.
  - For example, very low-priced devices, such as hand-held computers, are excluded by this definition.
  - On the other hand, the high end of the spectrum, the \$10,000 to \$15,000 range, includes such devices as IBM Displaywriter and Datamaster. Thus, by the definition of a personal computer in this study, IBM was in the personal computer marketplace before it ever offered the "personal computer."
  - The bottom limit of \$500 excludes many of the game or entertainment computers sold primarily for home use.
- We have defined the personal computer in this manner in order to focus on the very important business marketplace. Although many personal computers are used in homes, INPUT believes that the business market is going to be more important, and thus it is the focus of this research.
- Although the game and entertainment sector of the computer marketplace is largely excluded from this report, it is not because INPUT feels it is a trivial market. In fact, it is a very large market today and will continue to grow at a high rate. But the scope of this research was limited to the business sector.
- The most important reason INPUT segments the hardware market according to dollar value is that definitions based upon descriptions of the equipment are inadequate in a rapidly changing marketplace.



- When the personal computer was first introduced in 1976, it consisted to a large extent of 8-bit machines. Today, most of the new personal computers being marketed are 16-bit or 16/32-bit machines.
- Thus there is a problem when one defines the market by type of equipment. This is especially true when one anticipates the technological changes in the future wherein 32-bit processors in the personal computer marketplace will be widespread.
- Client comments and inquiries on this report are invited.



## II EXECUTIVE SUMMARY





## II EXECUTIVE SUMMARY

### A. ENVIRONMENT

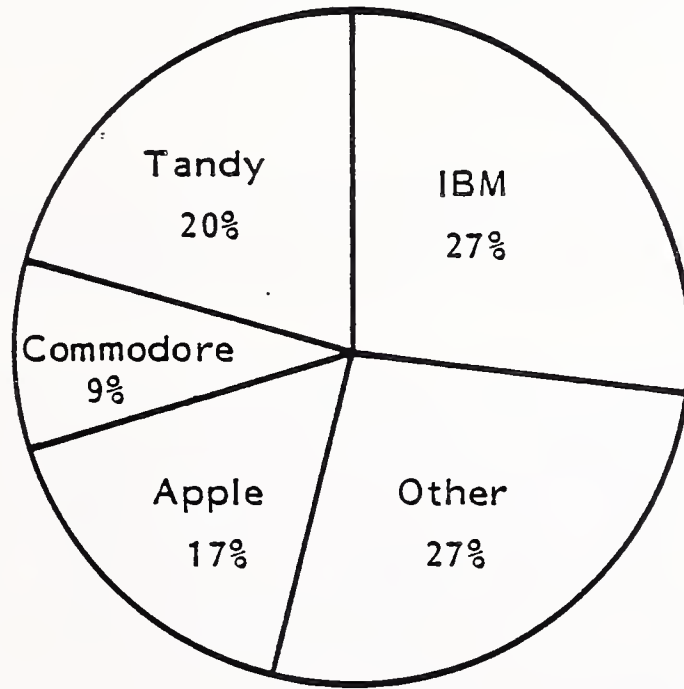
- In the 1980s technological change continues to accelerate. In particular, computer products are now changing so rapidly that evaluation, delivery, and installation periods are becoming in aggregate of the same order as the effective market life of the products. Nowhere is this change more in evidence than in the area of personal computers.
- The explosive growth of personal computer and terminal installations will result in "compubiquity" - computers everywhere doing all things. By 1986 about 20% of the working population of this country will use computers daily. This compares with less than 2% in 1976 and excludes home computer use. (Most home computer users, however, will also use computers at their workplace.)
- This change in the work environment will have impacts similar to but more fundamental than those wrought by television in the 1950s and 1960s.

## B. PERSONAL COMPUTER INSTALLATION GROWTH

- INPUT forecasts that by 1987 there will be 38 million computer units installed worldwide with purchase prices corresponding to the \$500 to \$15,000 range used in this report.
  - Tandy will have the largest number of these installations while IBM installations will have the greatest dollar value. IBM will have the largest share of user expenditures for personal computers, as shown in Exhibit II-1.
  - By 1987 the used personal computer market will be much in evidence, and many early users will be on their third-generation systems.
- Annual user expenditures in the U.S. for personal computer equipment will have grown from \$2.6 billion in 1982 to over \$10 billion by 1987.
- The average purchase price of personal computers will be about half the current level in real terms (i.e., allowing for inflation). The average purchase price of personal computers for business use was \$1,950 in 1981 and will be \$1,800 in 1987.
- The role of IBM in the personal computer market will be extremely important. According to the definition of personal computers used in this report, IBM was in the market even before it announced the Personal Computer, or PC, due to products like the 5120.
  - IBM has been a leader in recognizing the importance of connecting personal computers. PCs could almost be referred to as "personal connections," connecting individuals with each other and with data bases through local and remote networks.
  - New personal computers from IBM will have an even greater impact than the PC. For example, within 18 months INPUT expects IBM to

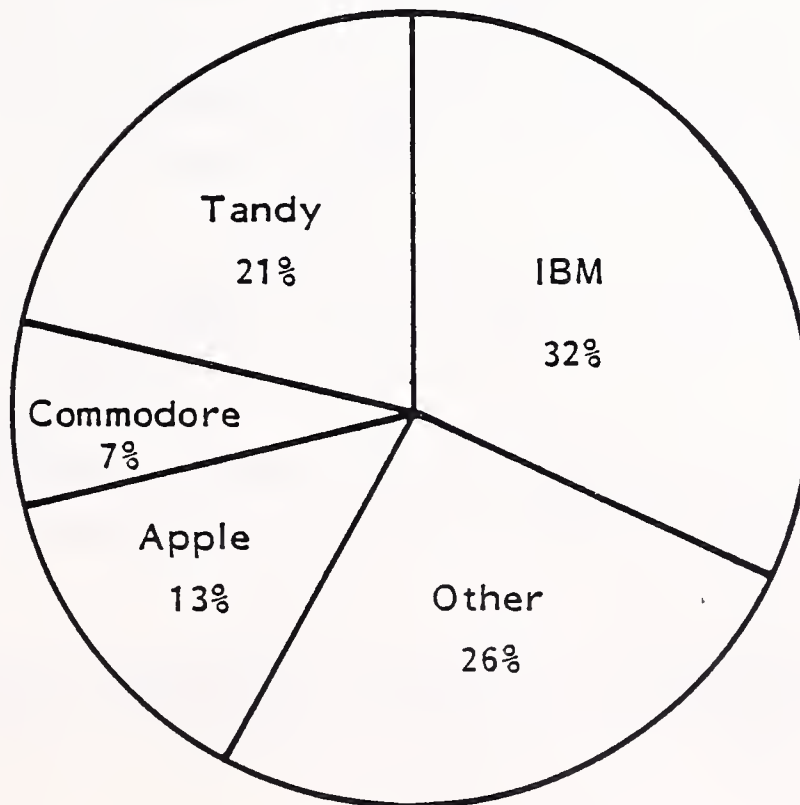
EXHIBIT II-1

WORLDWIDE PERSONAL COMPUTER EQUIPMENT  
USER EXPENDITURES BY MAJOR VENDOR



1982

\$3.9 Billion



1987

\$18.2 Billion

announce a 32-bit micro which will process a significant part of the 370 instruction set.

- This prospective announcement by IBM signals the rapid movement of basic processors for personal computers in business from the 8-bit through the 16-bit to the 32-bit level. The same change occurred much more slowly in minicomputers.

### C. PERSONAL COMPUTER SOFTWARE PRODUCT MARKET

- The U.S. personal computer software market will grow at an average annual growth rate of 43% from \$625 million in 1982 to \$3.7 billion in 1987, as shown in Exhibit II-2. These figures exclude the corresponding rapidly growing markets for game and entertainment software.
- From 1981 to 1982 the U.S. market for these products grew more rapidly than foreign markets. This situation will continue through 1983 and 1984. Then, as other countries' personal computer markets takeoff in the mid-1980s, the international software market will grow more rapidly than that in the U.S. Total worldwide software product expenditures for personal computers will reach \$6.7 billion in 1987, as shown in Exhibit II-3.
- In the U.S. the systems software market for personal computers will grow from \$310 million in 1982 to over \$1.5 billion in 1987.
  - This growth will be led by application development software including language and data base management packages.
  - The market for application development software packages will grow at an average annual growth rate of 38% to reach \$900 million in 1987.



EXHIBIT II-2

U.S. PERSONAL COMPUTER SOFTWARE MARKET, 1981-1987.

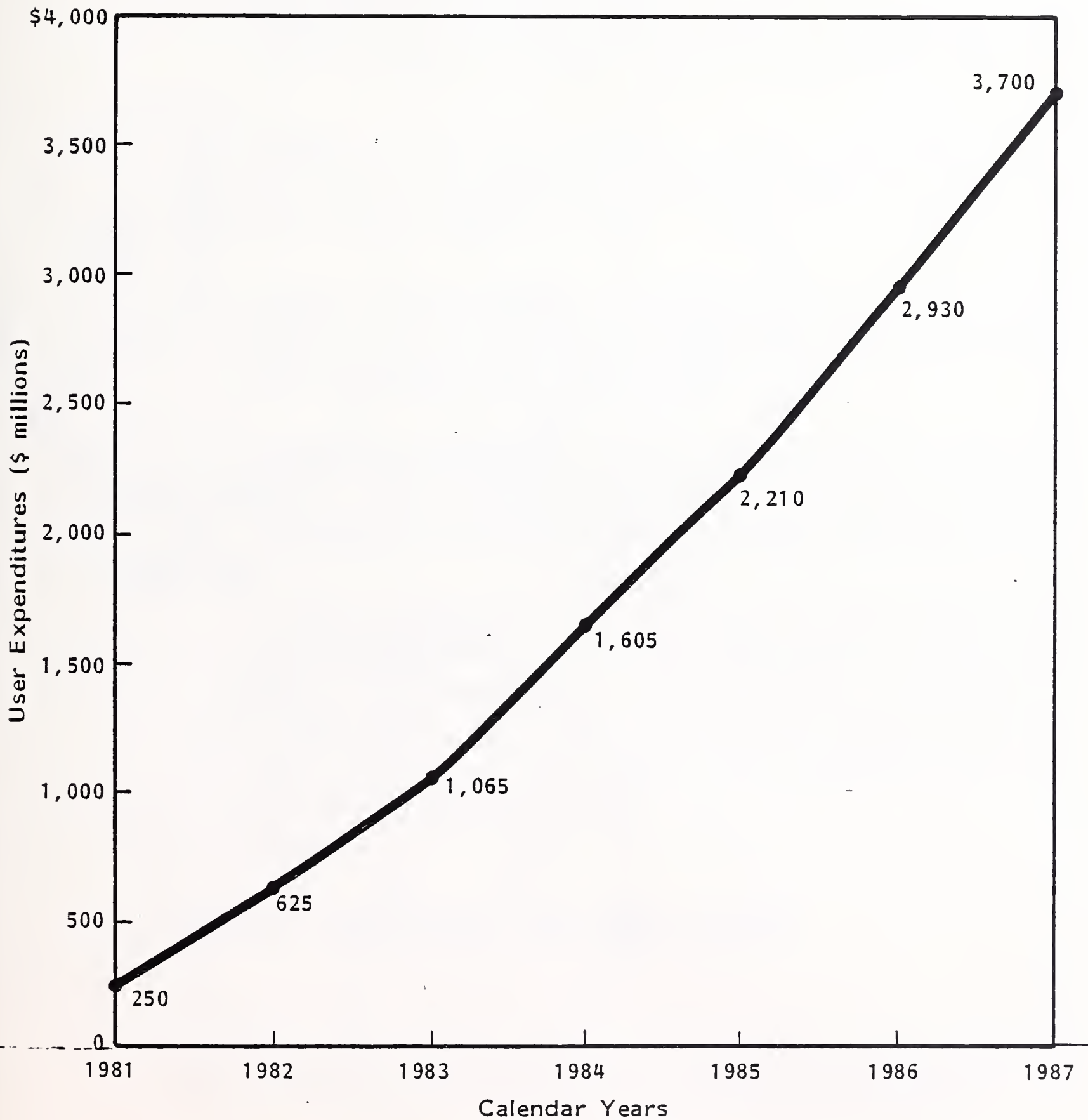
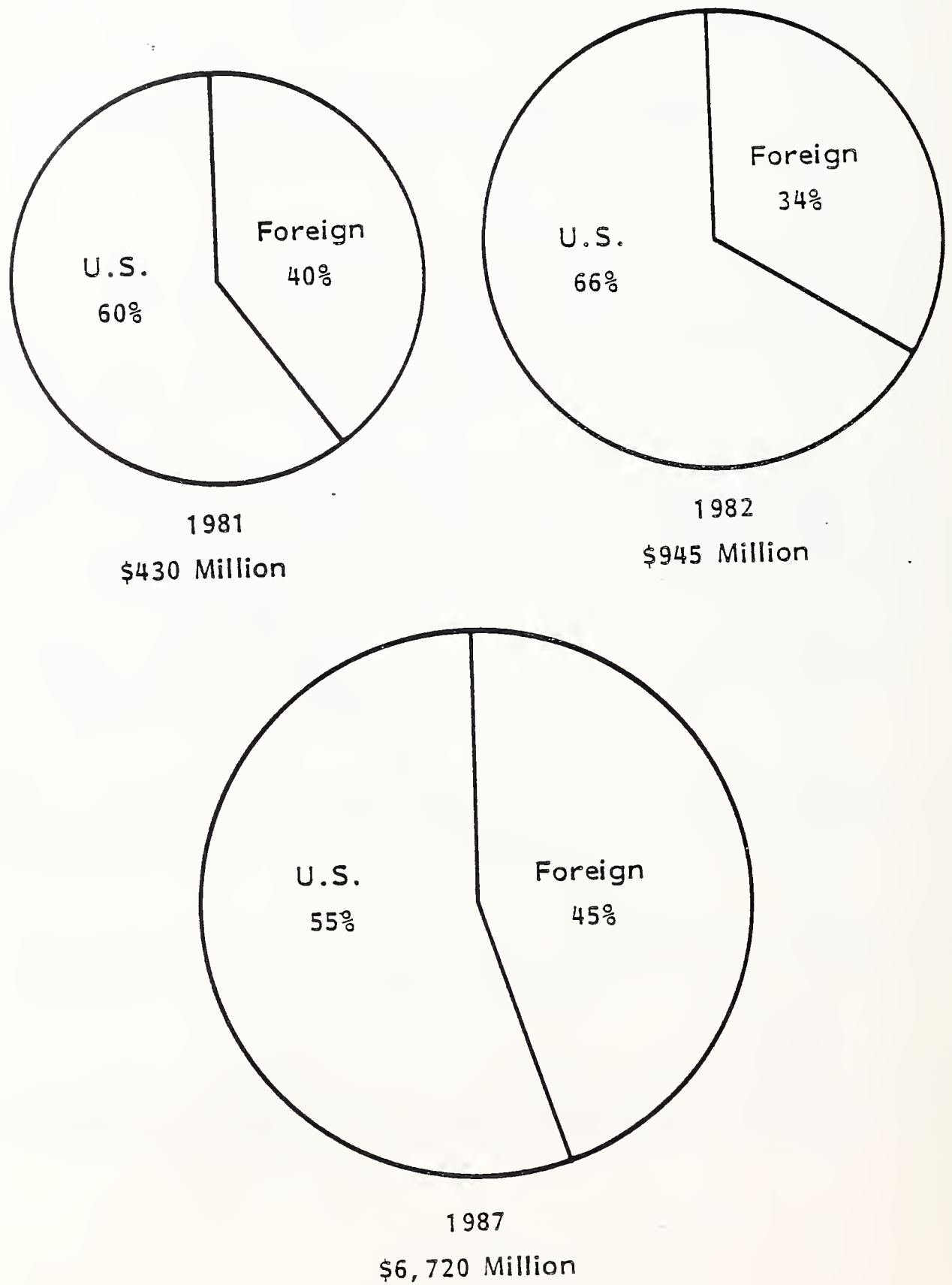


EXHIBIT II-3

INTERNATIONAL USER EXPENDITURES  
FOR PERSONAL COMPUTER SOFTWARE



- INPUT expects use of languages to shift from BASIC and PASCAL to C, APL, and applications generators.
- The data base management systems (DBMS) market will grow faster than other systems software products as larger disk units become attached to personal computers and the need for information (data and text) file management increases. This is a major opportunity area.
- The application software product market for personal computers will grow faster than the systems software market at a rate of 47% per year and will reach over \$2.1 billion in the U.S. in 1987.
  - Information analysis software including the "calcs" (to use a new generic word) will be the largest single application software product market reaching over \$900 million by 1987.
  - The fastest growing segment of this market will be industry-specialized products. There will be a variety of products with strong emphasis in the professional areas of accounting, law, medicine, and engineering.
  - In terms of installations, the fastest growing area will be word processing software. However, many office equipment suppliers will bundle word processing capability into their products. Also there will be intense price pressure in the word processing software area. As a result, the market will "only" grow at a rate of 38% per year and will reach almost \$400 million by 1987.

#### D. PERSONAL COMPUTER SOFTWARE MARKET ISSUES

- Perhaps the greatest deterrent to personal computer market growth is widespread computer illiteracy and a corresponding fear of the unknown.

- User education is thus the single most important issue during the forecast period.
  - This issue is being addressed in schools and universities so that by the late 1980s most young people entering the work force will be computer literate, especially college graduates.
  - The problem lies with the tens of millions of older people whose jobs the computer will increasingly threaten. This will be particularly true for skilled and semiskilled workers, including office workers and professionals.
- In order for the markets of personal computers and their attendant software products to grow as rapidly as forecast, great strides must be made in usability.
    - One key to software usability is startup time: the length of time it takes for a novice to learn to use it. This must be as short as possible, but the software must then be capable of growing with the user as he becomes more experienced.
    - Another key to usability is the ease with which a package is adapted to a particular user's needs. VisiCalc was successful because of the ease with which it could be adapted to a wide variety of applications.
    - For a software package to be successful, a user must be able to become fully acquainted with the package and have it operating within two or three hours.
  - Personal computers and their software must also be friendly to the user. User friendliness is measured in terms of convenience rather than time.
    - The software should instruct and train the user, and the user should be able to learn how to use it from the software.



- User friendly software watches for errors and takes corrective action. It guards against disastrous errors such as destroying files.
- Ergonomics is important in considering hardware, particularly the keyboard and screen. Flat screen displays, such as those on the GRiD system, enhance user friendliness.
- The linking of personal computers to each other and to central and departmental computers is a rapidly growing aspect of the market. Two improvements most needed by user respondents to the survey were networking capability and the ability to interface personal computers with mainframes.
  - Users definitely want access to the data bases resident on their corporate central computers. Thus, it is not simply a question of being able to tie through a network to the large computers but also of being able to work with the data bases themselves.
  - Possibly a major positive attribute of the networking of personal computers will be the ability to control software centrally and down-line load programs to meet individual's needs. Problems associated with this include the length of time to transmit a program over a network (a simple program on the GRiD system can take 10 minutes to down-line load versus less than a minute to load from floppy disk) and potential restrictions from software products vendors who see a market erosion possibility because of this technique.

#### E. DISTRIBUTION CHANNELS AND MARKETING ISSUES

- Retail stores are the single most important distribution channel for personal computers today. Their profit margins are being squeezed, however, and a shakeout is occurring. They have been plagued by high employee turnover and consequent customer dissatisfaction.

- Mail order distribution has contributed to the profit margin squeeze and also to maintenance problems. Apple has restricted mail order selling in response to these problems.
- Software, with relatively high profit margins, will be a mainstay of the independent retail computer store business. Some opportunity exists for software-only retailing, provided it is combined with evaluation, consulting, and support services.
- Support services are particularly important. INPUT's survey showed that small companies represent the largest group of customers for personal computers, and they generally have had little experience with computers.
- In the software package area, the explosion in numbers of products is causing severe problems for retailers and manufacturers. A major reason for the rapid growth of software distributors such as Softsel and VisiCorp is their ability to qualify software in terms of its quality, documentation, application, and maintainability.
- In general, users are satisfied with maintenance while vendors are concerned about the future. More and more vendors are attempting to introduce self-maintenance. The opportunity for independent maintenance business seems to be very large.
- User training and support are being addressed by local schools, trade schools, and independent companies offering group training sessions and seminars. Vendors are also trying to imbed tutorial capabilities in their software.

#### F. IMPACT OF PERSONAL COMPUTERS ON INFORMATION SERVICES

- In processing services, certain remote computing services (RCS) will be replaced by personal computers, particularly the problem-solving applications

which are relatively small and repetitive. Single-person, small-data-base, stable applications will also move from RCS to personal computers.

- On the other hand, personal computers will be additional outlets for data base services and for network applications such as electronic mail.
- Batch processing activities will also be affected by personal computers. In many cases they will supplement rather than totally replace batch.
  - Transaction processing will be done in batch and analytic processing on the personal computers.
  - A particularly important factor here is the maintenance issue since personal computers take at least 48 hours to repair under manual circumstances. Their users are cautious about placing time-critical applications on them.
  - Also, people factors become important. The scarcity of trained operators and support staff will cause many users to continue with services which are supplemented by professionals and managers using personal computers for analysis and control.
  - Batch services vendors have been major suppliers to small businesses. Their understanding of this area qualifies them to be distributors of personal computers to their customers.
- INPUT considers that processing services vendors have more to gain than to lose from personal computers in the long term. In the short term, most impacts will be negative. Companies will have to change their delivery and marketing mechanisms in order to benefit fully from personal computers.
- The professional services market related to personal computers is small, about \$25 million in 1982, but will grow to over \$250 million by 1987.

- Customizing software packages and developing custom software are major opportunities. Unfortunately, much professional support today is of poor quality since it is being offered by inexperienced moonlighters and cottage industry companies.
- Education and training services will rapidly grow in importance.
- Procurement services and consulting will also be used by small companies.
- Much of the professional services market for personal computers will be local.



### III USER BUYING PATTERNS AND MOTIVATIONS



### III USER BUYING PATTERNS AND MOTIVATIONS

#### A. PERSONAL COMPUTER USAGE

##### I. CURRENT INSTALLATIONS: VALUES AND PLANS

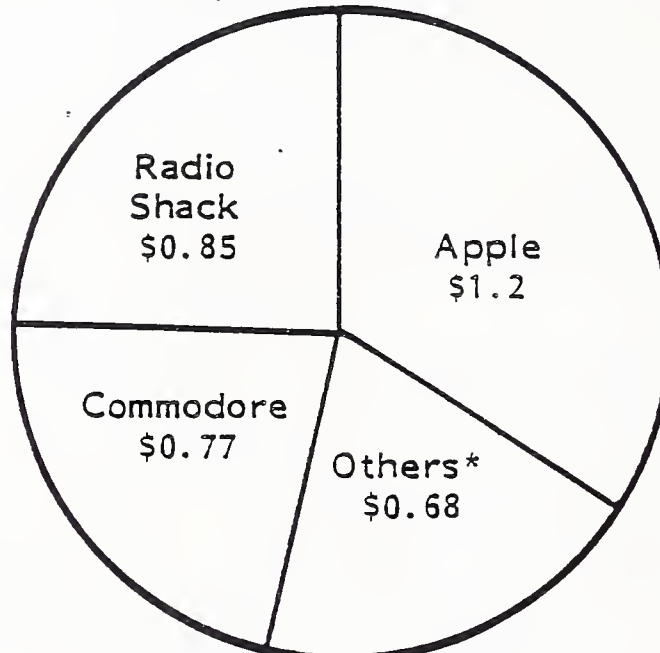
- Apple is number one in both the value and number of personal computers installed at the user sites of this survey's respondents, as illustrated in Exhibit III-1.
- The survey population of this study is 32. The average number of units installed per user is 24, with an average expenditure per user of \$109,000.
  - The average value of each unit is \$4,540, which is more than double the average national unit value.
  - The higher value reflects the need for greater capability in the business environment than in the home or education markets.
  - Business users tend to buy more RAM memory, larger disk storage capability, and higher quality printers than other users.
- Among the most widely used applications software today are finance and accounting packages.

EXHIBIT III-1

PERSONAL COMPUTERS INSTALLED  
BY SURVEY RESPONDENTS

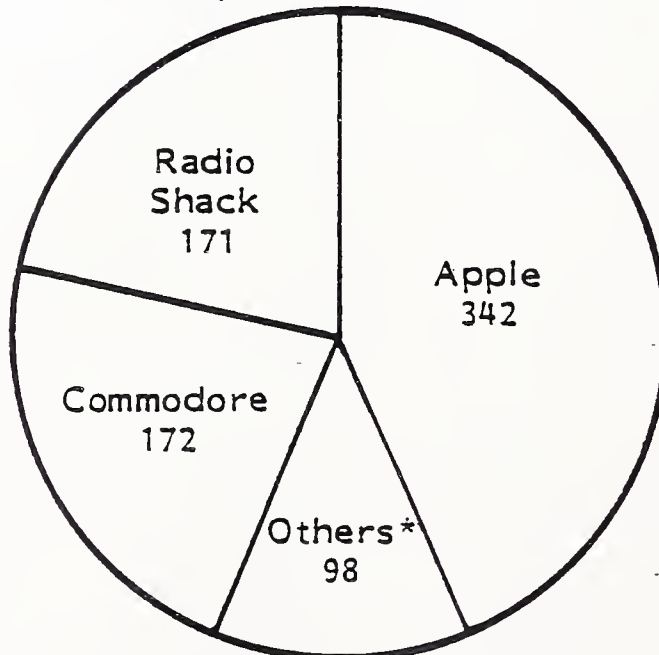
YEAR END 1981

Dollar Value of User Personal Computer Installations  
by Manufacturer



Total = \$3.5 million

Number of User Installations  
by Manufacturer



Total = 783 Installations

\* Others Includes: IBM, Dynabite, Xerox, Hewlett-Packard, Altos, Bell and Howell, Onyx, Northstar, Osborne, Data-point, WANG, NOVA, Zenith

- Managing the financial and accounting portion of a business or institution is critical to success. The personal computer is a very accessible means for an executive or manager to review present conditions and plan future activities more effectively.
- As 16-bit machines become more popular it is certain that finance and accounting software will increase in importance. In fact, the introduction of well-designed financial-planning software will be a major factor in 16-bit units sold.
- Word processing software products are also being widely used in industrial and office environments, and their use will increase in coming years.
- These applications make the personal computer a practical business tool. Its potential is now being tapped by powerful 16-bit machines and sophisticated software; however, its roots will remain in the basic day-to-day applications mentioned above.

## 2. IBM'S PERSONAL COMPUTER

- Most users surveyed by INPUT had decided to purchase 16-bit rather than 8-bit machines. When asked why, many users stated that the extra power was a definite consideration. Most indicated, however, that IBM's entry into the personal computer market really influenced their leaning toward the 16-bit machines.
- IBM has encouraged outside vendors to develop packaged software for its system. The IBM personal computer comes with an optional C/PM operating system in a move to address the most likely industry standards.
- IBM's largest contribution to the personal computer industry has not been its technological advances so much as its name and the credibility that goes along with that name.



- IBM's marketing efforts will accelerate the use of personal computers in large corporations.

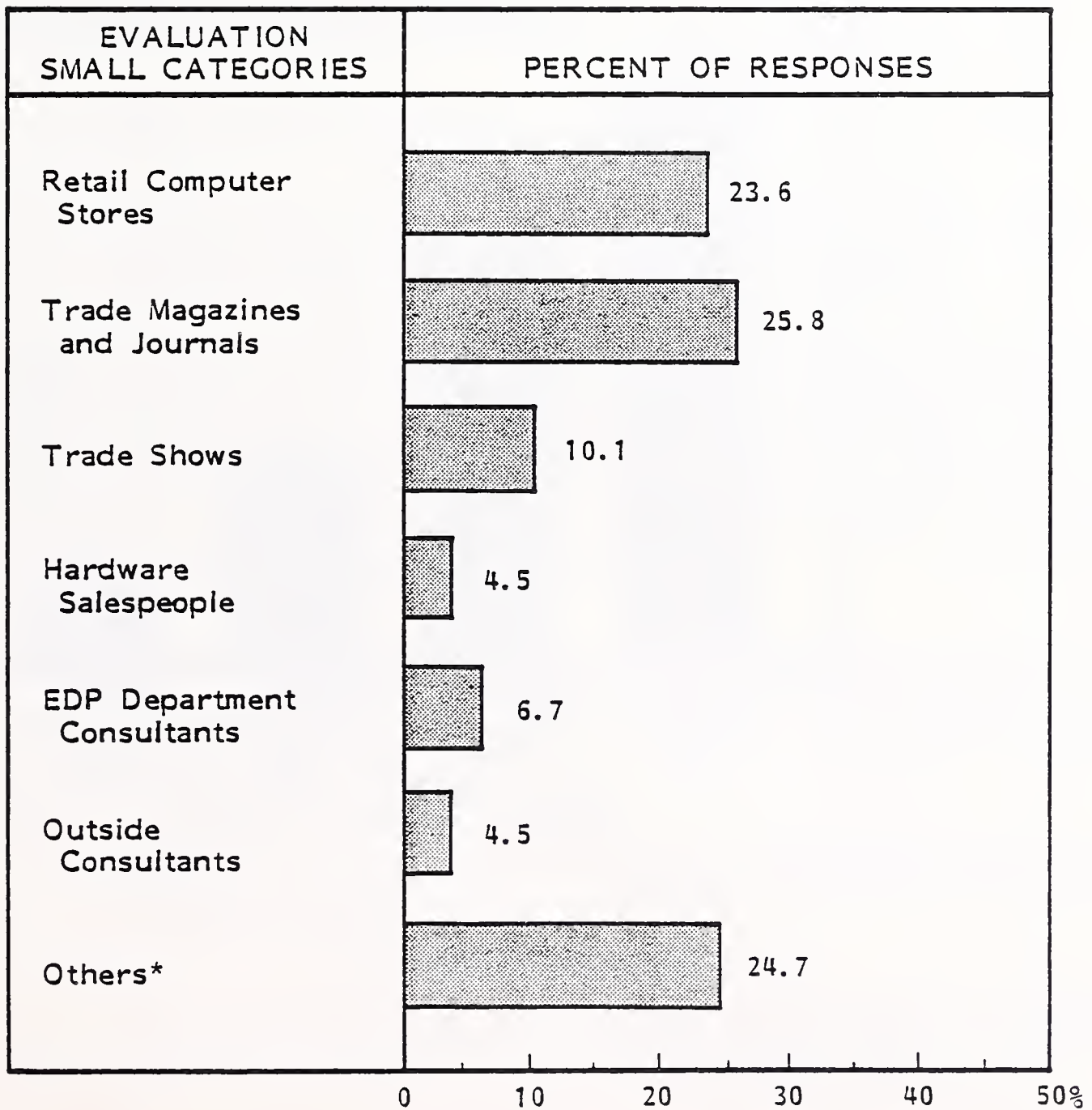
## B. PURCHASING PATTERNS

### I. USERS' HARDWARE EVALUATION SOURCES

- INPUT's survey attempted to gain insight into two areas regarding the user's evaluation of hardware:
  - All the major sources of evaluation called upon by the user.
  - The favored, or most highly valued, source of evaluation called upon by the user to make the ultimate decision to buy hardware.
- To determine all the evaluation sources of hardware being used, INPUT's survey allowed for a multiple response from all 32 users interviewed. The question asked was, "What sources have you used in evaluating personal computers in the market?" Exhibit III-2 illustrates the response. Trade magazines and journals, others, and retail computer stores, in that order, rank as the most significant sources. The "others" category may be defined as in-house experts, end users, and peer contacts.
- The second part of the above question asks, "Which source was best and why?" Exhibit III-3 illustrates a very different response from the first part of the question. It asks for only one response from each user to clearly distinguish the favored source of evaluation.
- The category "others" dominated the response, indicating the value placed on a more personal relationship when evaluating hardware. This relationship could be dependent upon the user's working environment or a personal relationship in a broader sense; i.e., a friend who owns a personal computer.

# EXHIBIT III-2

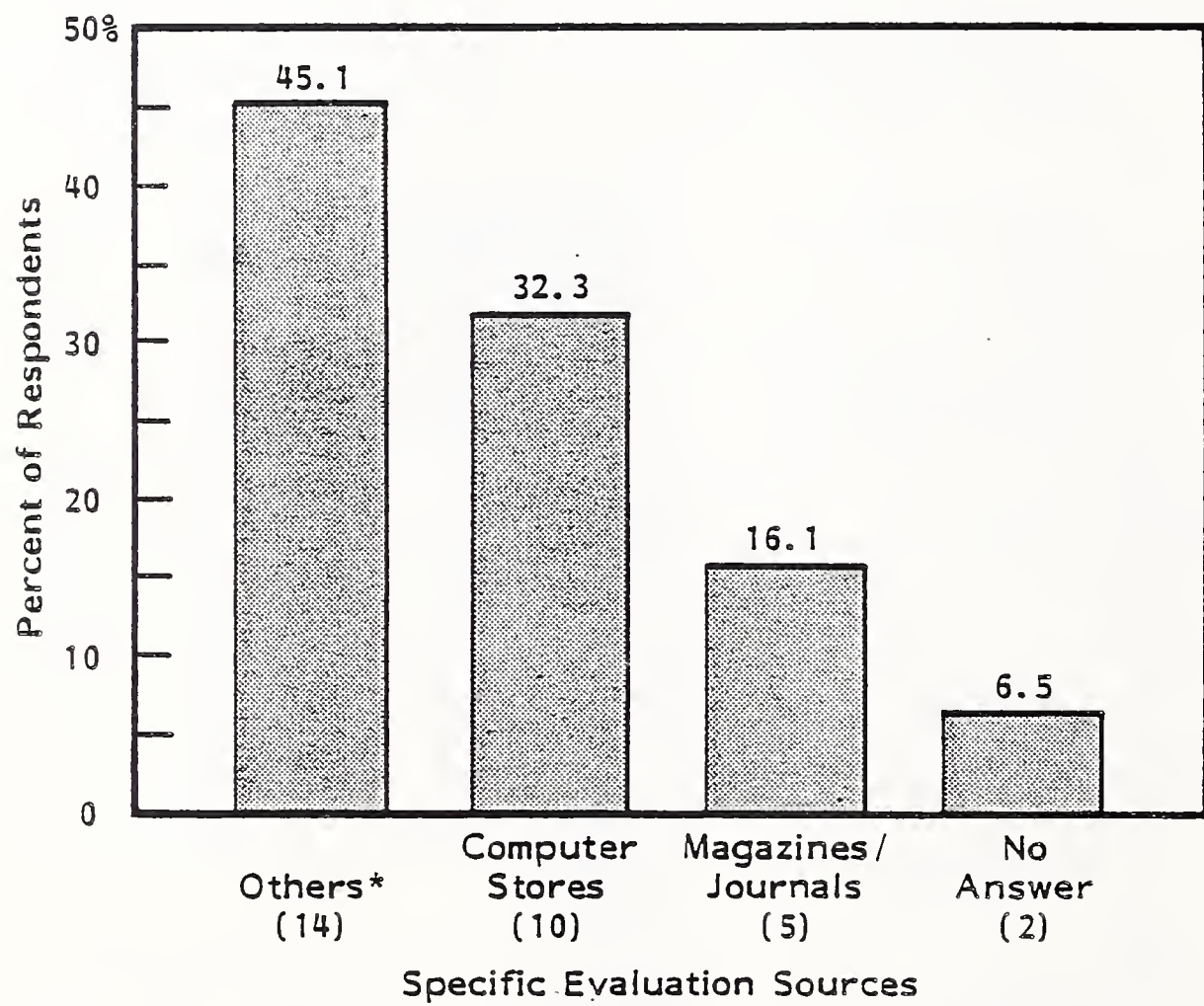
## PERSONAL COMPUTERS - EVALUATION SOURCES



\* Others may be largely defined as in-house experts and end users.

EXHIBIT III-3

FAVORED SOURCES OF EVALUATING PERSONAL COMPUTERS



\* Others may be largely defined as in-house experts and end users.

- Users rely on direct advice from others with more experience in equipment selection because of their own lack of knowledge about a product they perceive to be esoteric and highly technical.
- Sellers of personal computers should recognize this apprehension on the part of prospective users and take steps to reduce it.
- Advertising will help, but it will not eliminate the customer's fears.
  - Demonstration and tutorial applications software will help users feel more comfortable with systems.
  - Better trained retail personnel will also help.
  - Rental programs or short term trial periods may also reduce the prospective buyer's reservations and result in sales.
- Retail computer stores, the second best source in evaluating personal computers, follows logically, in that a computer store offers a variety of hardware configurations available for users to actually operate. Salespeople are also available to demonstrate particular machine characteristics and provide general operating instructions when necessary.
- Magazines and journals were the third evaluation source preferred by users. They provide technical data, new machine offerings, and performance reports on the machines being considered.
  - Magazines and journals were rated highly in part due to their impartial and comprehensive assessments.
  - More importantly, magazine articles are often written by more knowledgeable individuals than the typical retail salesperson.



## 2. JUSTIFYING THE PURCHASE

- INPUT's survey evaluated the primary reason for the purchase of a personal computer. The respondents were allowed to answer the question with more than one justification. All purchase justifications were then tabulated for a total number of responses in each category.
- The primary justification for purchase was cost. Computing capability at a low price versus expensive timesharing was the most notable justification. What continues to spur this buying justification onward is the increasing power and sophistication of personal computers at affordable prices.
- The second justification was efficiency/productivity. The personal computer offers time savings where a computer has not been available before and in many cases where only a larger computer has been available before.
- The other justification categories were all subsets of either cost or efficiency/productivity.
- As personal computers priced under \$15,000 become more powerful and take on jobs previously requiring larger systems, the cost benefits will become apparent.

## 3. APPROVAL CYCLE

- INPUT focused on those surveyed to distinguish the common approval cycles found in each industry sector, which are:
  - Education: an executive committee responsible for reviewing budgetary requests.
  - Software services: direct approvals reviewed and signed by the president and/or owner.



- Service companies: direct approvals reviewed and signed by the president and/or owner.
  - Manufacturing: an approval given by the president and/or the finance executive.
  - "Other" category: president and/or owner approval.
- The personal computer approval cycles revealed in this survey may be atypical. While it is true that in smaller companies and organizations the president has final approval for such purchases, this is not usually the case in larger companies. In larger companies the president is normally too high a level to sign off on small capital expenditure requests. Personal computers may be the exception to this because of the ramifications involved with implementing personal computers in place of larger systems. Those ramifications are:
    - Potential savings to the company by the supplementing of large system processing.
    - Greater productivity at all management levels.
    - Enhanced control over operations at all levels.
    - Increased computer literacy.
  - Senior management is also concerned about potential negative impact of personal computers, such as:
    - Diverse and inconsistent data bases.
    - Lack of security for programs and data on personal computers.

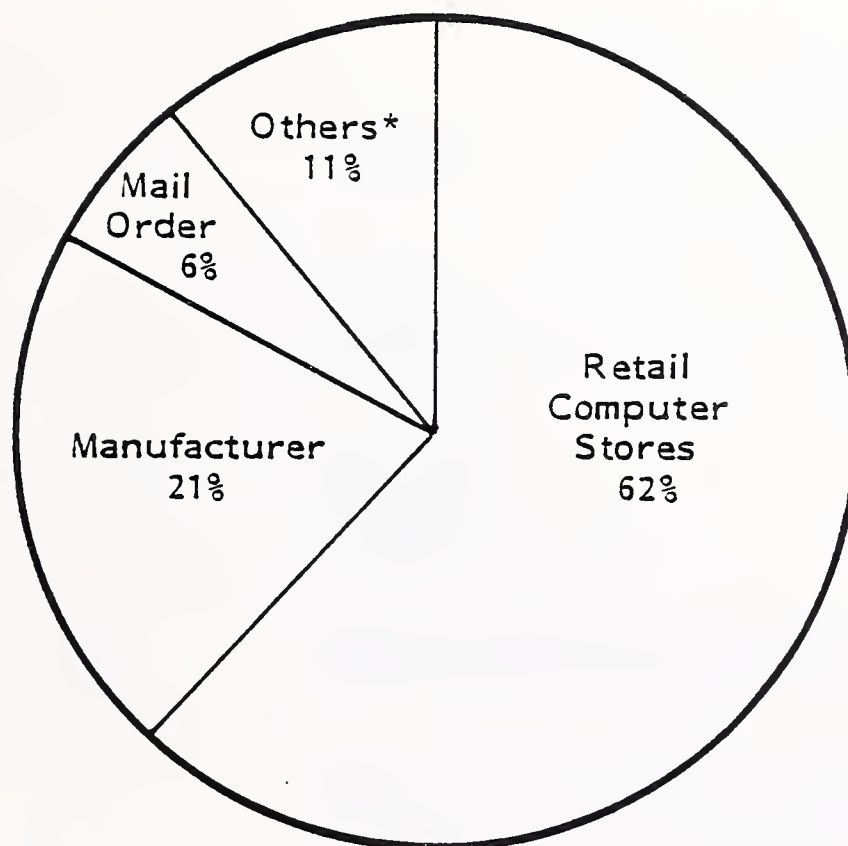
- Proliferation of dissimilar systems resulting in additional training requirements, inefficient use, and additional software expenditures.
- Increased costs due to individual rather than centralized purchases.
- Upper management should maintain sensitivity to personal computer implementation to ensure their full and proper utilization.

#### 4. PURCHASE SOURCE

- As illustrated by Exhibit III-4, retail computer stores are the overwhelming point of purchase chosen by those users interviewed. Retail computer stores are very accessible; they have units for demonstrating; and they provide service, instruction, maintenance, and professional services in some instances.
- Factory direct purchasing has been relatively uncommon but is growing in importance.
- Manufacturers have been reluctant to alienate their retail dealers by taking large orders directly from major buyers, but this is rapidly changing.
- Most of the leading manufacturers have set up national account programs to handle orders of 20 units or more.
  - Competition is forcing vendors to offer discounts up to 35% on large orders which preclude the involvement of middlemen.
  - Large buyers are also setting up in-house stores to handle departmental needs.
  - An increasing number of sophisticated users will also maintain their own equipment or turn to third-party maintenance organizations.

EXHIBIT III-4

WHERE PERSONAL COMPUTERS ARE PURCHASED



Percent of Respondents

\* Others are wholesalers, OEMs, integrated systems manufacturers, and distributors.

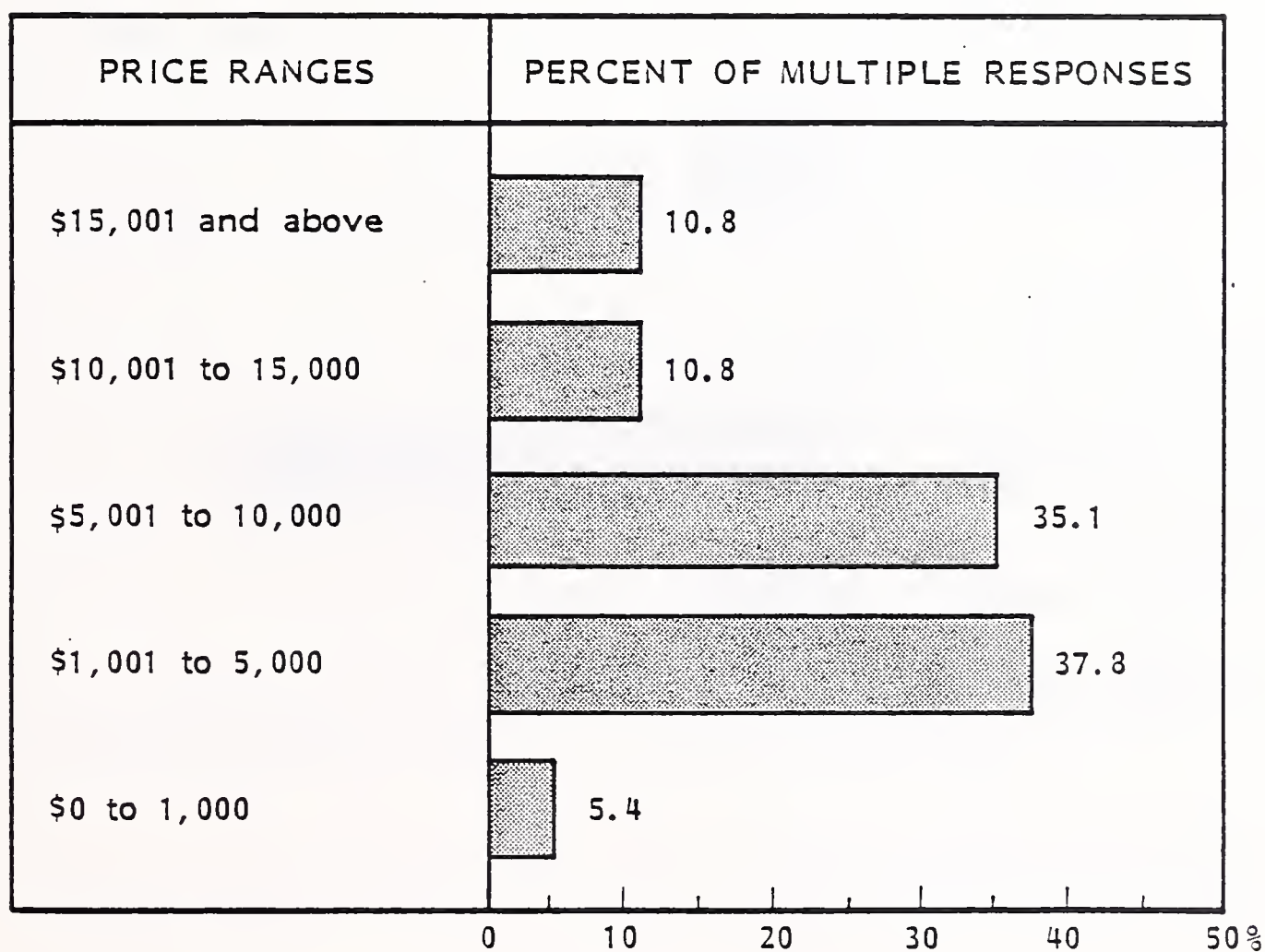
- Some personal computer purchases are exceeding the price paid for large mainframes. General Electric recently purchased \$10 million worth of personal computers from IBM in a single order.
- Mail order accounted for 6% of the purchase source share. Mail order is expected to decline as manufacturers discourage that mode of delivery.

## 5. PRICE AND CONTRACT

- In order to forecast the price ranges of personal computers and the methods of their purchase over the next four years, INPUT determined the users' present methods of purchase, rent, or lease.
- Exhibit III-5 shows that of those interviewed for this survey, 38% would be making purchases in the \$1,001 to \$5,000 range, and 35% from the \$5,001 to \$10,000 range. INPUT sees no reason to suspect that this will change given the prices of the new 16-bit machines. However, an unknown that could change the minds of this survey's respondents is the introduction of 32-bit machines. These systems command a higher price than their predecessors.
- A typical configuration(s) in the \$1,001 to \$5,000 range is a processor, one to two floppy disk drives, a monitor, and a low-cost printer.
- In the \$5,001 to \$10,000 range a configuration will include a processor, two floppy disks, one hard disk in place of a floppy disk drive, a high-resolution monitor, and a letter quality printer.
- The \$10,001 to \$15,000 range might look like a processor, two hard disk drives (Winchester technology), a high-resolution monitor, and a superior printer.
- INPUT's survey shows that the majority of personal computers are being purchased as opposed to rented or leased, as shown in Exhibit III-6.

# EXHIBIT III-5

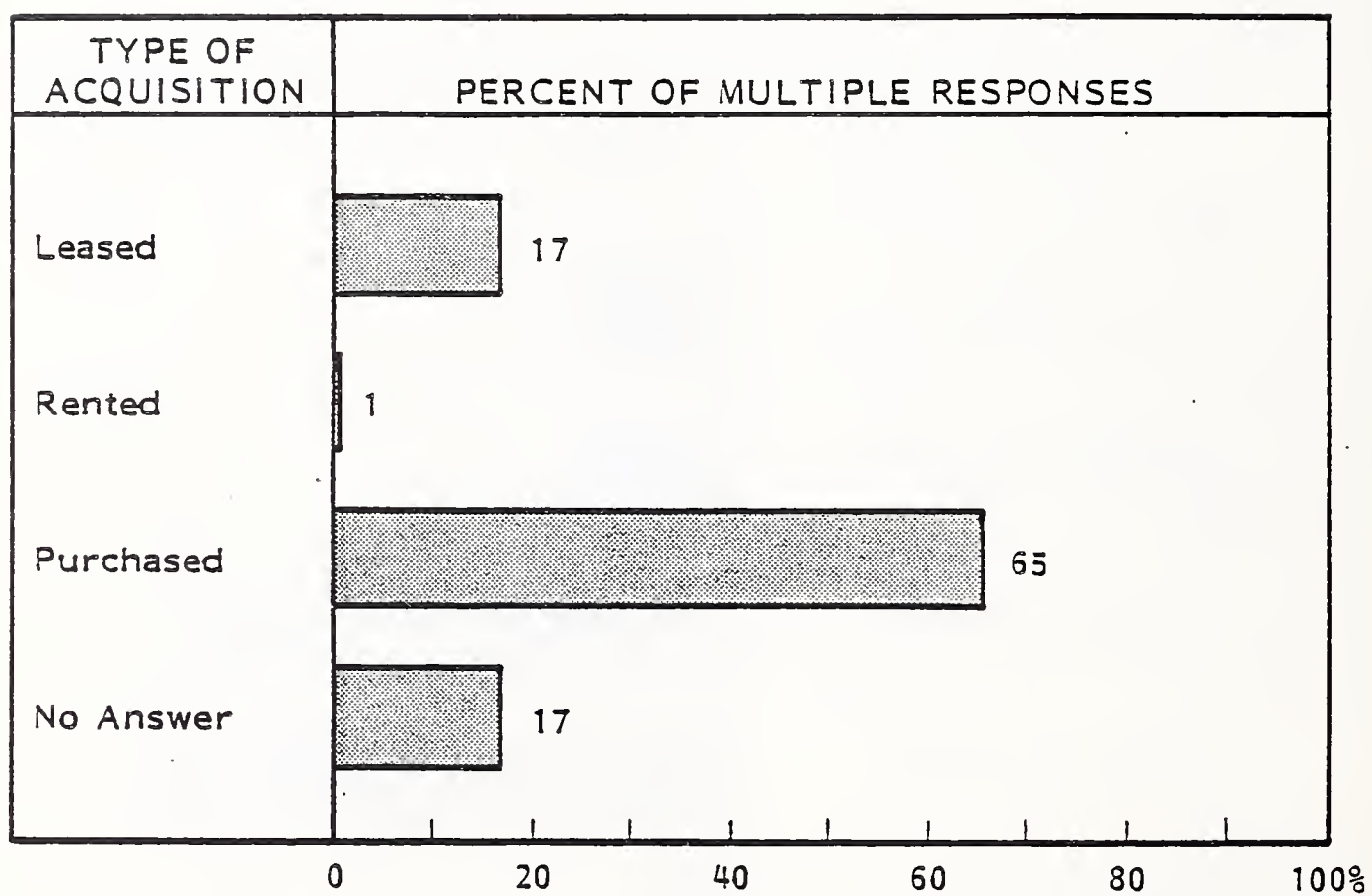
## PROBABLE PURCHASING RANGES TARGETED BY USERS FOR 1982 TO 1985





# EXHIBIT III-6

## HOW PERSONAL COMPUTERS ARE ACQUIRED



- Renting with the option to buy could be a way of increasing units sold. This technique would address that segment of the market which is reluctant to buy due to a lack of experience with computers.
- More personal computers would be both leased and purchased if retailers offered easy financing.

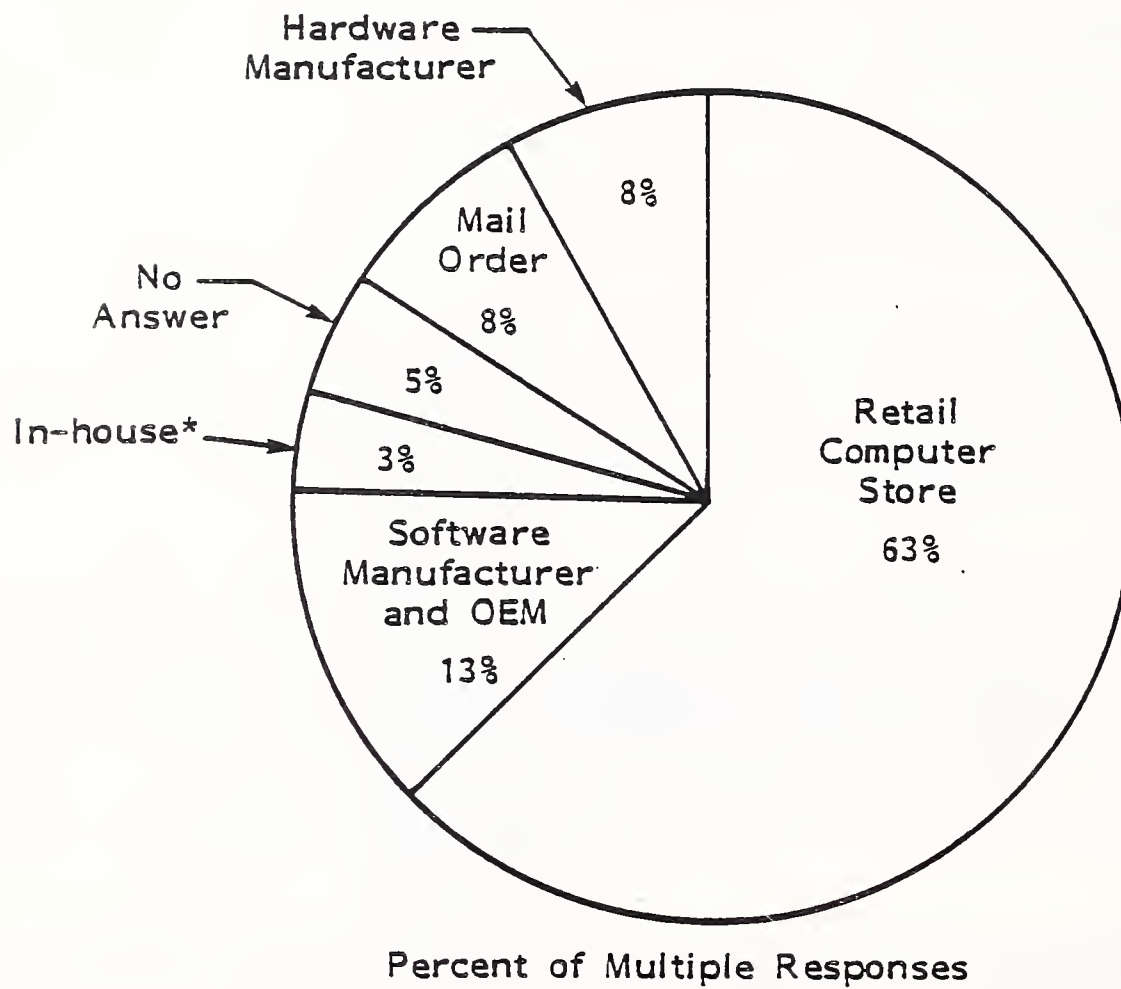
## C. SOFTWARE USAGE

### I. SOURCE OF SOFTWARE

- INPUT asked the question, "What are your major source(s) of software acquisition?" The respondents were allowed to give a multiple response in order to determine all acquisition sources being used.
- Exhibit III-7 illustrates that retail stores are the major sources of software acquisition by the users interviewed. Retail stores will become increasingly greater software acquisition sources over the next five years as personal computer installations increase. Software, with its relatively high profit margins, will be an important source of revenue for retail computer stores.
- The respondents to this survey indicated that software manufacturers and OEMs were second in importance for software acquisitions.
- Hardware manufacturers are sources of compilers and other systems software for their machines.
  - Hardware manufacturers will strive to increase their share of user expenditures by offering more software.
  - Many of them will acquire software for resale through independent third-party vendors.

EXHIBIT III-7

MAJOR SOFTWARE PURCHASING SOURCES



\*In-house refers to those departments buying personal computers through a company purchasing agent.

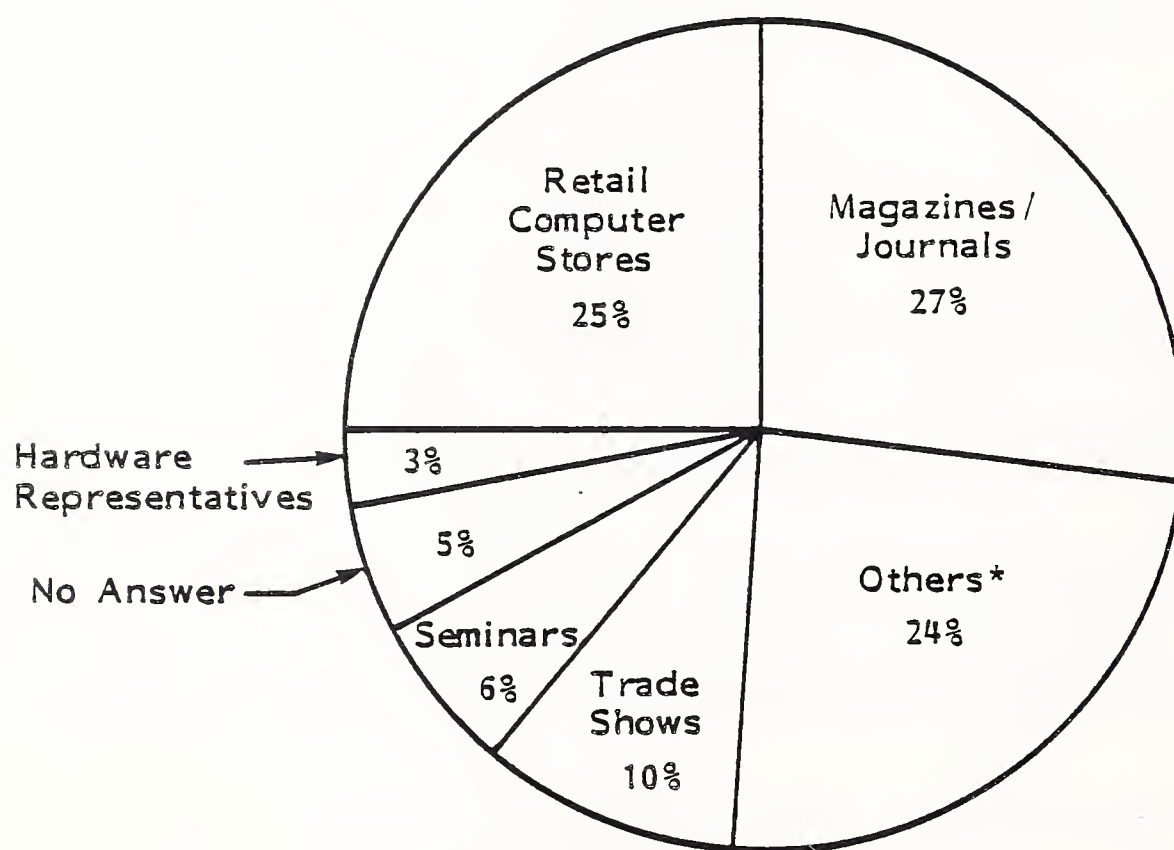
- Some manufacturers will also attempt to increase their profit margins through in-house development of software or through the acquisition of independent firms.
- Retail computer stores must concentrate the qualifications of their software vendors in order to serve the user properly. Computer stores are often seen by users as ignorant and poor sources of software expertise.
  - This condition provides an opportunity for entrepreneurs to create retail outlets specializing in software products only.
  - The possible advantages of such retail outlets are high profit margins, the ongoing review of software with expert staffs, and the presentation of software features and benefits more effectively than would be possible in a general purpose personal computer outlet.

## 2. SOFTWARE EVALUATION SOURCES

- INPUT asked the question, "What sources are used in evaluating software." The 32 participants were allowed to give a multiple response in order to determine all the evaluation sources being used in making a buying decision:
- The three major sources as shown in Exhibit III-8, were:
  - Magazines and journals.
  - Retail computer stores.
  - Others.
    - The "others" category represents in-house consultants, peer contacts, and end users themselves.

EXHIBIT III-8

MAJOR USER SOURCES FOR EVALUATING SOFTWARE



Percent of Multiple Responses

\*Includes in-house consultants, peer contacts, and end users.



- During this survey INPUT discovered that the "others" category had the greatest effect on an individual or a company decision to buy one software package or another. Retail stores served largely as a place to actually witness the software operating before committing to buy. Magazines and journals were a means of finding technical data and user reports/findings on newer software packages coming into the market.
- The "others" category gives the potential buyer an opportunity to get an unbiased evaluation from someone familiar.
  - The "others" category also creates an opportunity for the buyer to evaluate software being used for a similar application, since the buyer feels, "If I ask my peer about his experience addressing this application with this software I'll find out the pros and cons."
  - This discussion points to a lack of credibility, perhaps, regarding other software outlets, but it seems to be the way users feel most comfortable in making software decisions.

### 3. LANGUAGES USED

- INPUT asked the question, "What programming languages are being used?" Using a multiple response format, the 32 respondents answered as follows:
  - Twenty-four respondents used BASIC.
  - Nine respondents use PASCAL.
  - Five respondents use COBOL.
  - Six respondents used Assembly.
  - Five respondents used FORTRAN.

- One respondent used "other".
- Two respondents gave no answers.
- The high incidence of BASIC is not unusual in that virtually every personal computer is offered with BASIC as the standard language.
- PASCAL is used fairly widely for two reasons:
  - Users find it more attractive than BASIC because of its faster execution.
  - Application developers prefer it because it is more portable than BASIC.
- COBOL usage will become more widespread as 16- and 32-bit processors proliferate and more COBOL compilers become available.

#### 4. SOFTWARE CUSTOMIZATION

- In probing to determine the opportunity for professional services in the personal computer world, INPUT asked the question, "Is there a need for software customizing?"
- The 32 respondents answered as follows:
  - Twenty-two respondents answered yes to a need for customization.
  - Seven answered no.
  - Three did not answer the question.
- When asked, "Who provides customizing presently?":

- Eighteen stated that either members of the user group or in-house experts, i.e., the EDP department, provide customizing.
  - Two stated that the vendor provides customizing.
  - Twelve of those interviewed failed to answer the question.
- Personal computers are becoming more powerful; thus they are becoming more able to address complex applications. Accounting, human resources, financial modeling, and production control are applications that are being addressed with personal computers. Each of these categories and several others are generically similar but very different given the environment. For example, an accounting system within a manufacturing environment will differ greatly from an accounting system within a medical environment. These different environments amount to "vertical" markets in terms of software design.
  - Therefore the opportunity for professional service via software customization is immense. This is made obvious by the number of applications being addressed by personal computers which were never before practical because of the size, accessibility, and cost of larger computing machines.

## 5. APPLICATIONS USED

- The applications software products most widely used by the participants in INPUT's survey are word processing packages. This is because word processing is applicable to any office, business, institutional, educational, or personal environment.
- What the INPUT respondents did not illustrate is the importance of accounting, financial modeling, inventory control, and human resources packages. Fewer accounting packages are bought than word processing packages, but since their average unit price is higher, they will result in nearly equal user expenditures over the next five years. With the introduction of the 16-bit system, it is now possible to use highly sophisticated applications software

written for minicomputers. The challenge here is to adapt this software into a more user-oriented package so that it is practical for the greatest number of personal computer users.

## 6. SYSTEMS SOFTWARE USED

- The two systems software packages used by the majority of those who responded to INPUT's survey are:
  - VisiCalc.
  - Data Base Management Systems (DBMS).
- VisiCalc is the most popular software package in history. The personal computer owes much of its success to VisiCalc because people have bought personal computers so that they could use VisiCalc, not the other way around.
- VisiCalc has become dated and is being challenged by more advanced spreadsheet packages which will eventually force improvements on VisiCalc. In fact, as this study was being completed, VisiCorp announced an advanced version of VisiCalc for the Apple III.
  - This version addresses many of the weaknesses of earlier versions made evident by competitive products.
  - The new version also manages to maintain the simplicity of use which has made it so popular with end users.
- The Advanced Version of VisiCalc is high-priced at \$400. Undoubtedly, many competitors will introduce lower priced products in order to compete for this market.

- As data storage capability increases for personal computers, so does the need to manage that data efficiently. The most important features being offered to the personal computer user via DBMS are:
  - Ease of use.
  - Flexibility.
  - Low cost.
  - Screen-oriented data entry.

## 7. SOFTWARE BACKUP PROCEDURES

- INPUT's survey asked users, "Are you satisfied with backup procedures for your software?" Twenty-three respondents answered yes, they were satisfied; four answered no, and five did not answer the question.
- Most packaged or self-generated software is simple to duplicate, thus creating instant backup. This is a real advantage of the floppy disk medium.
- Protected software is practically impossible to back up conveniently without actually buying an extra diskette. Many times backup is left to the vendor, which makes quick access to the backup diskette impossible in critical situations.
- Providing backup software for protected packaged software in order to prevent piracy is a hot issue.
  - Vendors don't want to sell a package that can be duplicated and distributed because of their investment and potential loss of revenue. Therefore, they will protect by programming technology and vendor distribution.



- Users, on the other hand, are concerned with the availability of a backup source when they need it and with the high price of buying many software packages.
- Software vendors as a group have not addressed the backup problem to the users' satisfaction.
  - The vendors' legitimate concern with software piracy cannot be questioned.
  - But the techniques employed to foil the pirates has hurt the end user, who has equally legitimate concerns.
- Software vendors should provide a free backup disk with each package. This would solve some of the immediate problems but not all of the long-range ones.
- Users of Winchester disk drives and local area networks with shared hard disk storage facilities have a strong need to store programs on those facilities. But software vendors are attempting to prevent users from advancing away from the more cumbersome floppies to hard disk in these environments since this process reduces the number of software units sold.
- Innovative hardware vendors will provide a solution to the users' problems. Hardware is coming onto the market which will enable the user to store any RAM resident program onto a floppy-disk or hard-disk media regardless of the software techniques employed by the software vendors.
  - A plug-in card selling for less than \$100 is already available for the Apple II with this capability.
  - Additional products are expected to be sold in conjunction with standalone hard-disk drives.

## D. MAINTENANCE AND SUPPORT

### 1. SOURCE OF MAINTENANCE FOR HARDWARE

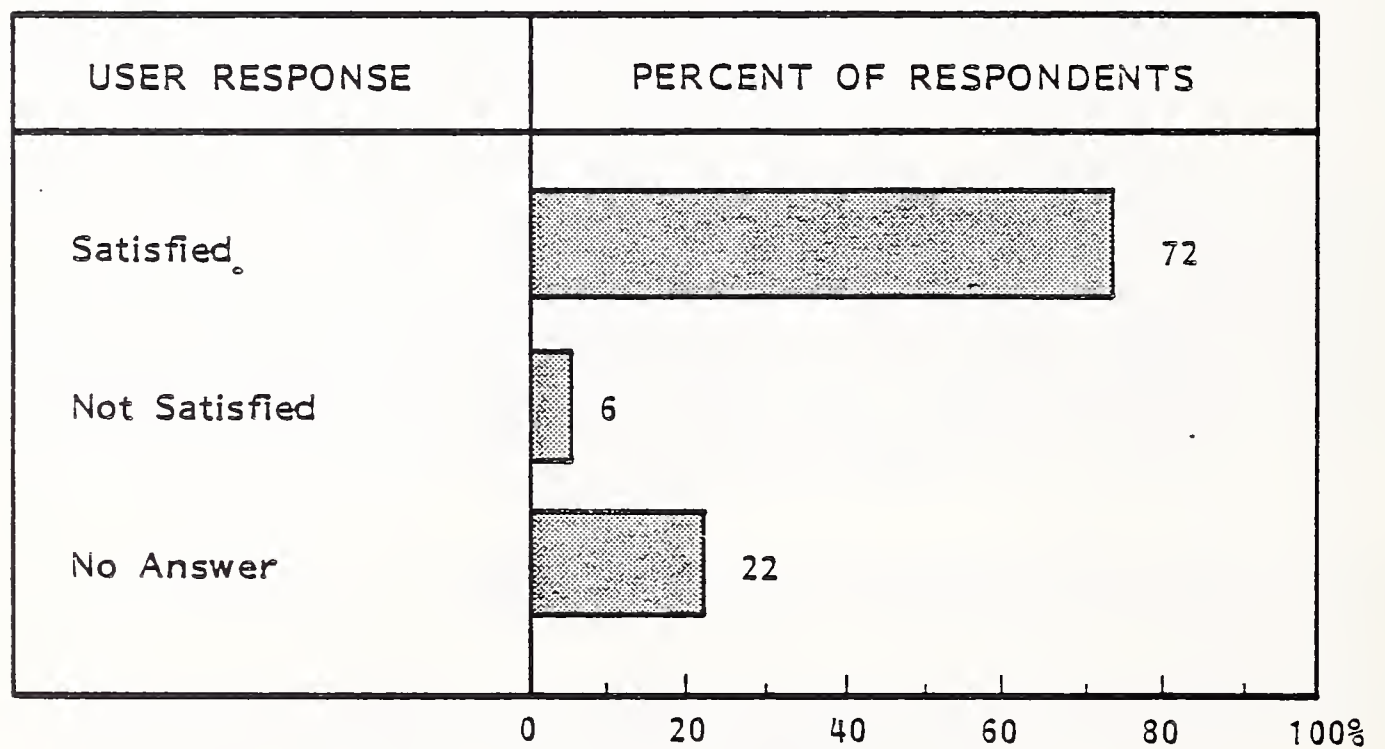
- Maintenance sources available to the users are fairly limited, so an immediate dependence upon the hardware vendor is inevitable. Out of 32 users interviewed, 62.5% relied on the hardware vendor for maintenance, 15.6% had in-house maintenance available, 12.5% gave no response, 6.3% used maintenance vendors for service, and 3.1% had no maintenance relationship with any service group.
- The major maintenance vehicle for the vendor is the retail computer store. A number of retail computer stores refuse service to users who have not purchased the computer from their store. This is due to the highly competitive personal computer hardware market which has narrowed profit margins considerably. Many store owners resent users who have contributed to this state of the market.
- There is opportunity for "maintenance only" vendors who can operate at lower overhead levels, provide dedicated service, and take advantage of the competitive relationship between retailers.

### 2. SATISFACTION LEVELS FOR HARDWARE

- INPUT's survey shows that despite a very competitive retail environment which views users critically in terms of providing maintenance service, most users are satisfied with maintenance.
- Exhibit III-9 shows that over 70% of the users interviewed are satisfied with the hardware maintenance provided. The users indicating their satisfaction with maintenance service are, for the most part, using their original vendors for service.

# EXHIBIT III-9

## USER SATISFACTION WITH CURRENT HARDWARE MAINTENANCE



- Hardware vendors are very aggressive about providing good service to those customers who did purchase hardware from them.
- When businesses or families move to new locations or retail stores go out of business, however, the question is, who will be willing to serve those users in such a way that loyalties to the industry are maintained?
- Enlightened store management should recognize that any user represents an opportunity.
  - Maintenance and service fees should contribute to profits.
  - Users represent high potential for sales of supplies, peripherals, software, and various other add-ons.
  - Stores that discourage dealing with users who bought their systems elsewhere are cutting themselves off from lucrative revenue streams.

### 3. MAINTENANCE FEES FOR HARDWARE

- A large number of users pay a maintenance fee for hardware. Maintenance fees vary from vendor to vendor.
  - Six percent to eighteen percent of the original purchase price is quoted by vendors.
  - Thirty-five dollars to fifty-five dollars an hour for noncontract service fees are typical.
- Turnaround times for minor repairs average about 48 hours.
- Most service contracts are for in-store repair.

- Some stores will provide a variety of options ranging from in-store service to on-site service.
- On-site service contracts are often double the cost of in-store service.
- With approximately four million installations of personal computers projected by the end of 1982, field service of those systems represents a major opportunity.
- Because of multiple installations at single sites, in-store service will be acceptable to many users because of the lower cost and their lack of dependency on a single system.
- Owners of single systems will prefer on-site service, and even large multi-user installations will prefer the convenience of this service.

#### 4. SOFTWARE MAINTENANCE

- INPUT's survey shows that the majority of software maintenance is provided by in-house people, be they users or programming specialists. This indicates that a significant amount of software is being developed by the user.
- Software vendors are also a major group providing software maintenance.
- The inclination toward in-house software maintenance is based on cost savings, familiarity with the applications being addressed by the software package, availability for maintenance work, and the ongoing development of in-house maintenance/programming resulting from such an exercise.
- Software vendors remain an important source due to their expertise with the product and the lack of interest displayed by many users in actually wanting to develop the expertise needed. It is both time-consuming and expensive to take on such a task, especially for smaller companies and budget-restricted institutions.



- The majority of software maintenance entails program customizing, updating, debugging, reformatting, and rewriting.
- It is recommended that smaller companies use the vendor service being offered, instead of developing an in-house expert. This is because smaller companies do not need a lot of software alteration and, therefore, the occasional expense for expert maintenance will be reasonable.
- In large companies it is advisable to develop in-house expertise because of the greater demand being placed on software by end users.

## 5. MAINTENANCE FEES FOR SOFTWARE

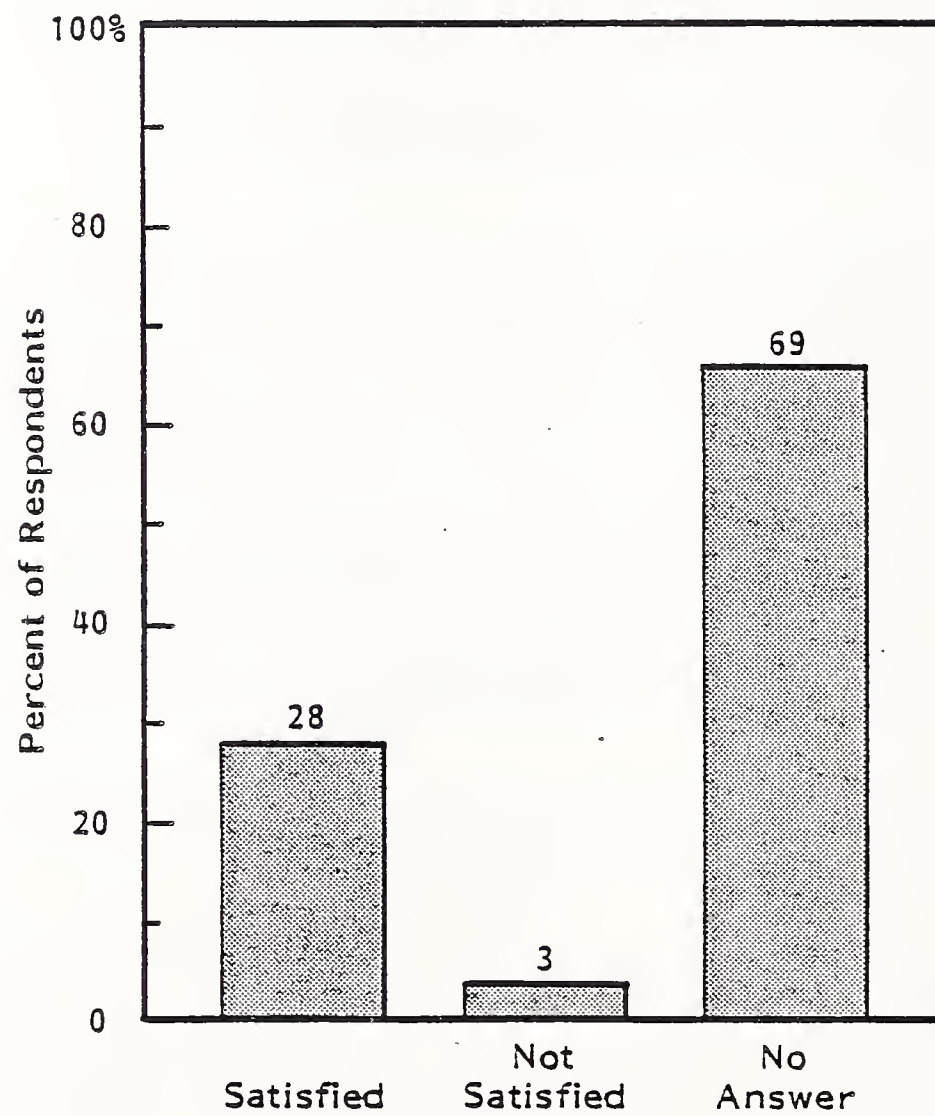
- The common response to this category is "no response." It is interesting that the majority of respondents either did not know if maintenance fees were a part of maintenance service or simply chose not to answer the survey question.
- Twenty-three percent stated that there were no maintenance fees. Most software packages are sold "as-is" without maintenance.

## 6. SATISFACTION LEVELS FOR SOFTWARE

- As shown in Exhibit III-10, most respondents are using package software for which no maintenance is offered or used.
- Most of the other respondents were satisfied with present software maintenance levels. This indicates that the software vendors or in-house experts are providing the level of programming, program updating, and error removal needed.
- Within those companies and institutions that can afford to have an EDP department with individuals who are trained to be software experts, in-house maintenance will always be a preference.

EXHIBIT III-10

USER SATISFACTION WITH CURRENT SOFTWARE MAINTENANCE



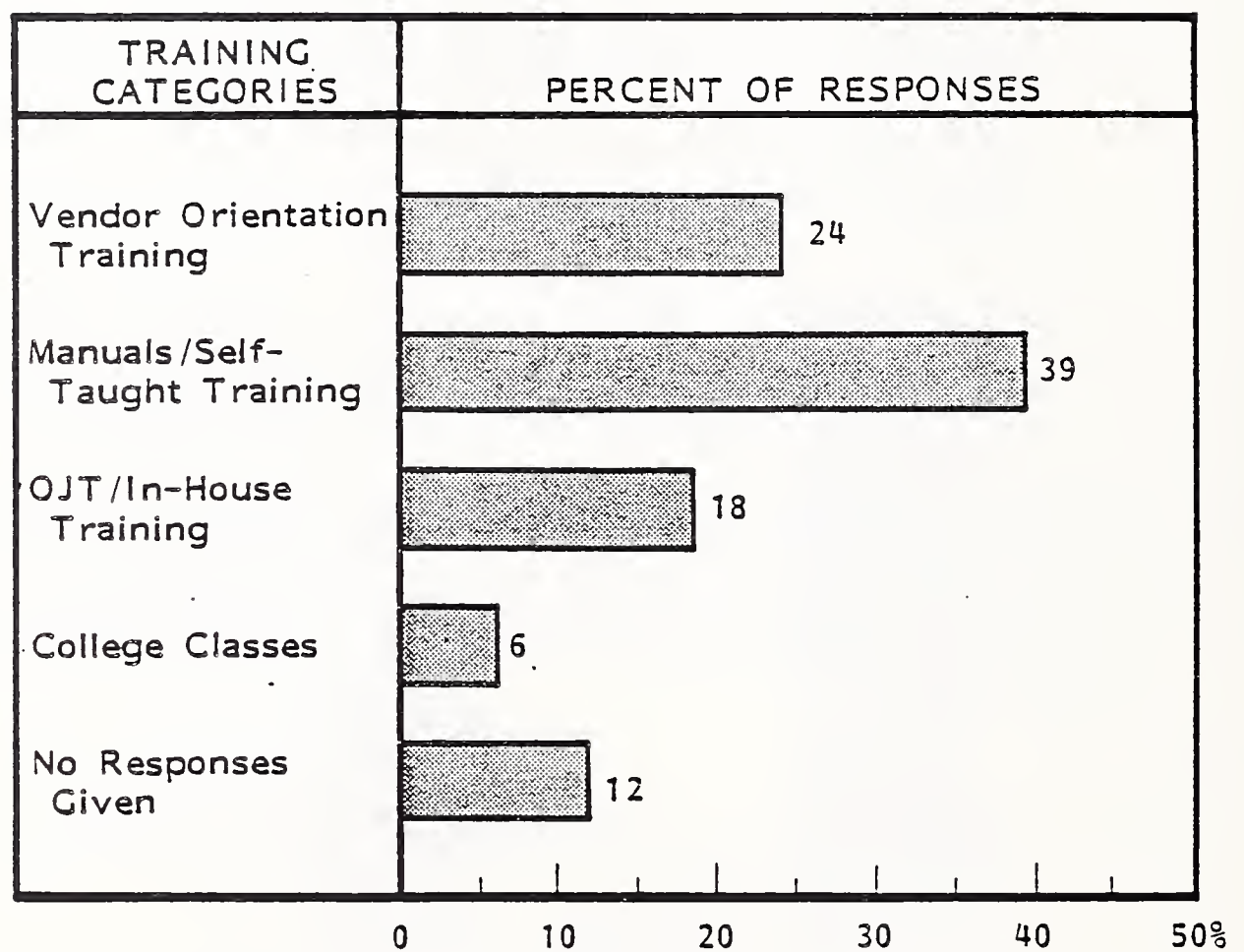
- Small companies will tend to rely on the independent software expert, retail computer stores, and systems integrators for software maintenance. The primary reasons are intermittent expense, lack of necessity for a full-time programmer, and dependency on complex programming.

## 7. TRAINING: HARDWARE AND SOFTWARE

- The major method used in training end users on hardware is self-teaching using manuals, as shown in Exhibit III-11.
  - This method was roughly distributed throughout all industry sectors and businesses surveyed. Although it obtained fairly satisfactory results, one would expect some formal orientation given the potential use of the equipment and its expense.
  - This is, however, one of many instances in industry where training is left out of a program until there are negative results.
- As shown in Exhibit III-12, manuals and self-teaching are also the major means by which end users are provided with software training. It is even more surprising that software orientation is not provided within companies and institutions.
  - Clearly there is an opportunity for more training programs to be offered to end users.
  - Self-guided software packages, seminars, comprehensive literature, and classes are a few such opportunities.
- The majority of respondents stated that future training should be conducted in-house by way of on-the-job training. This method has its advantages in eliminating "just an orientation" approach by vendors, assuring competence for the application needs of the job, developing an ongoing, proven program, and providing convenience.

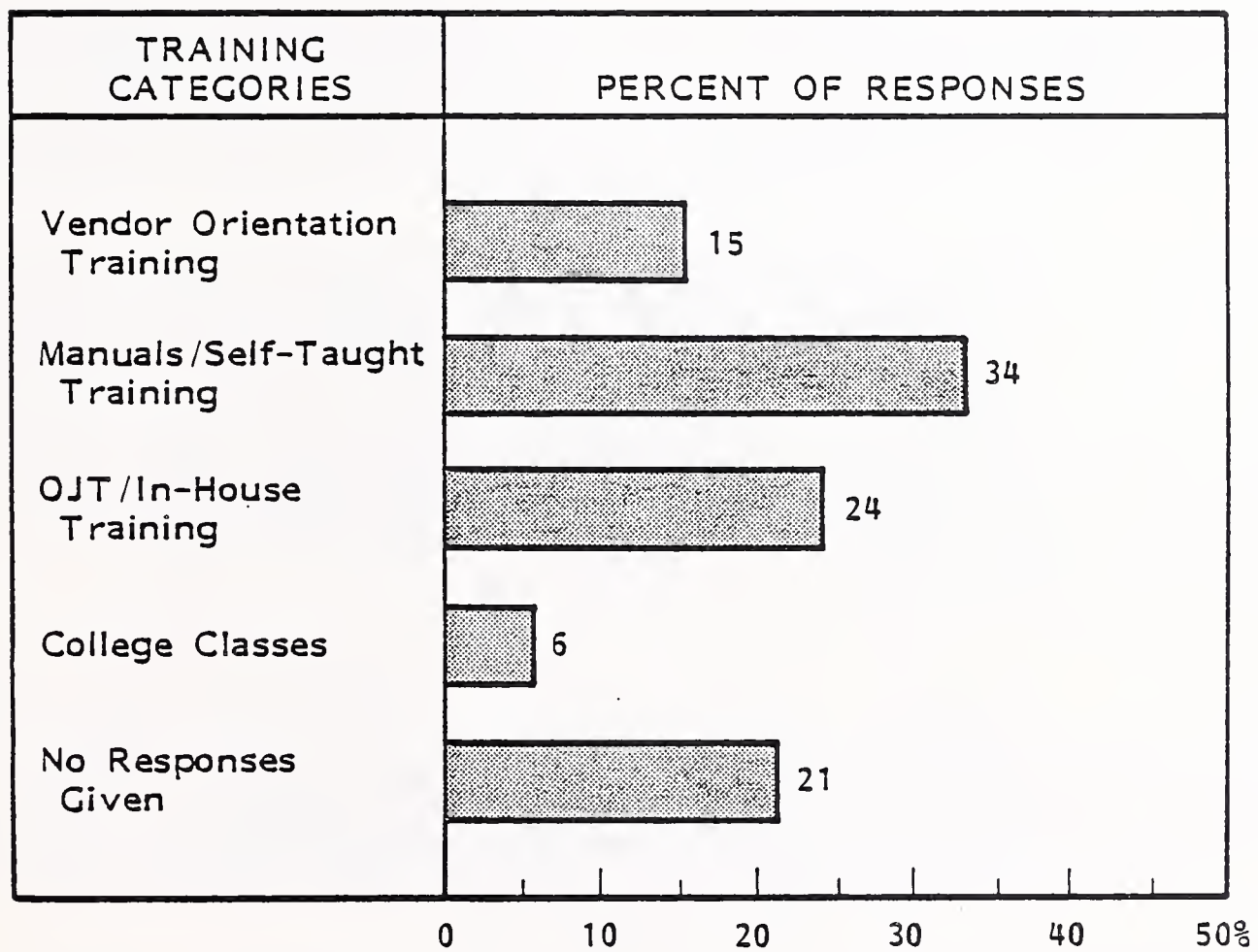
# EXHIBIT III-11

## TYPE OF HARDWARE TRAINING PROVIDED TO END USERS



# EXHIBIT III-12

## TYPE OF SOFTWARE TRAINING PROVIDED TO END USERS





- Professional training has its place at the beginning of an in-house program and for individuals who wish to learn about personal computers.

## 8. PROFESSIONAL SERVICES USED

- Forty-one percent of the companies surveyed had used professional services. This was primarily for software customization and, in a few cases, application definitions.
- There is tremendous opportunity for development of a professional services industry within the personal computer world. More powerful hardware and more complex software will require this type of expert attention and support.
  - The business community will be in particular need of software customization in the very near future. Business users are favoring the 16-bit system as a cheap yet direct way of handling a variety of applications which cannot be addressed as efficiently by larger systems. The major drawback of these new systems, though, is the lack of available software.
  - It can be anticipated that proven vertical market software will not be available to personal computers for some time. Because of this, there will be a very strong need for customizing skills to adapt software to needed applications as personal computers become more of a way of life for businesses and institutions.
- These services will be very local in nature with short and relatively small contracts. They will primarily be provided by cottage businesses with low overheads.

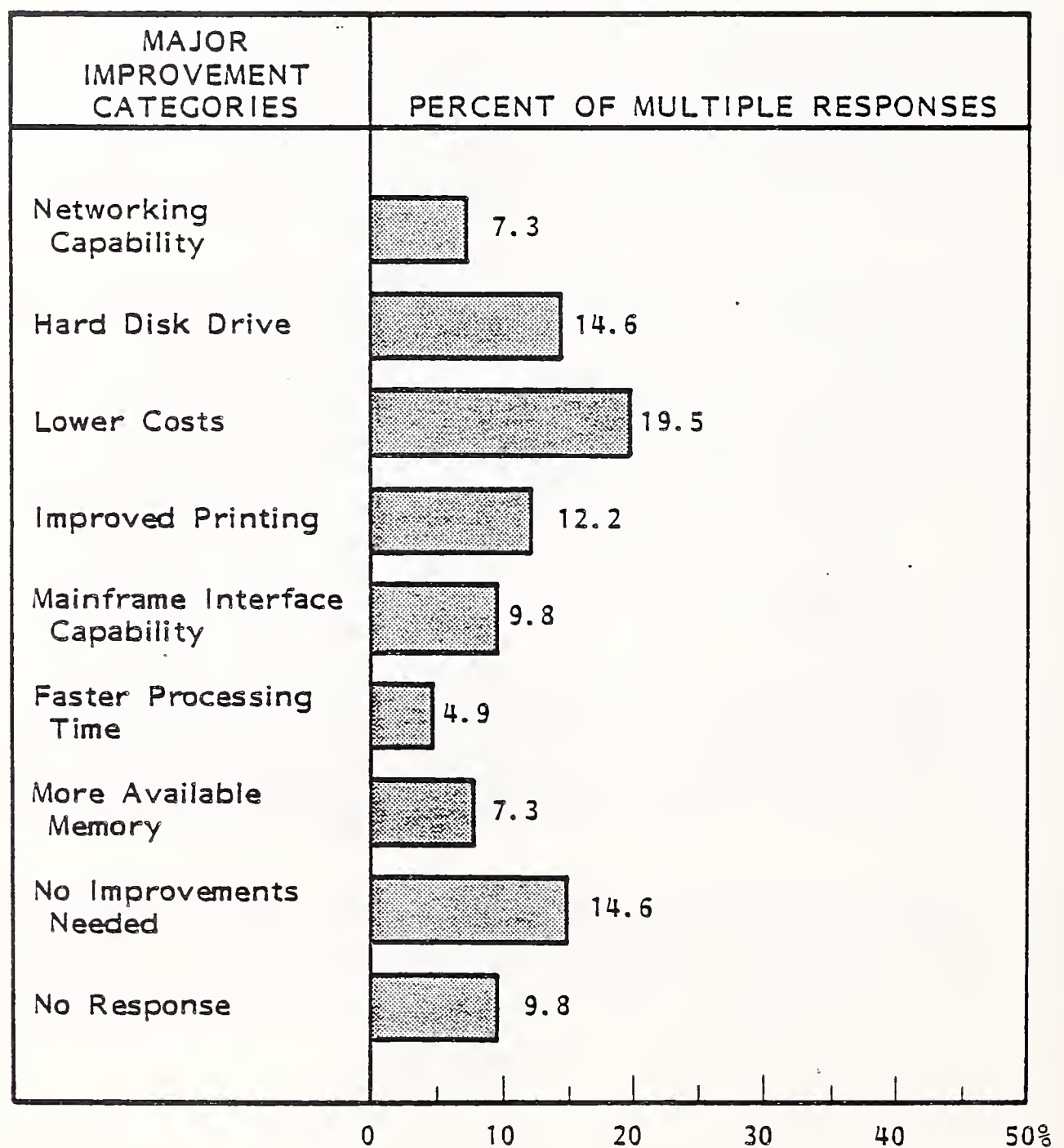
## E. IMPROVEMENTS NEEDED

### I. HARDWARE AND COMMUNICATIONS

- In terms of hardware and communications, lower hardware costs and networking capability were the two areas of most concern to the users responding to INPUT's survey, as shown in Exhibits III-13 and III-14.
- Hardware costs will continue to drop for some time. This is due primarily to the vigorous state of competition among hardware manufacturers and distributors and the continuing ability of technology to contribute to lower hardware costs via miniaturization and greater capacity chips.
- Local area networks are a high priority need for many personal computer users.
  - Users desire this capability primarily to share the cost of relatively high-priced Winchester disk drives. A secondary need is to share the cost of letter quality printers and other peripherals such as line plotters.
- Users also need to interface with data bases on their in-house mainframe systems. Users find that there are very few software products that provide a clean and easy interface with large-scale systems.
- Independent networking systems allowing for access to remote data bases are being established in many areas of the United States. The networks offer vast libraries serving an array of business clients and educators. Some of these networks are available to individuals as well.
- There is little doubt that networking will become more and more a fact of everyday life. It promises to offer electronic mail, direct audiovisual communication, and greater access to vast pools of information. Cost will be

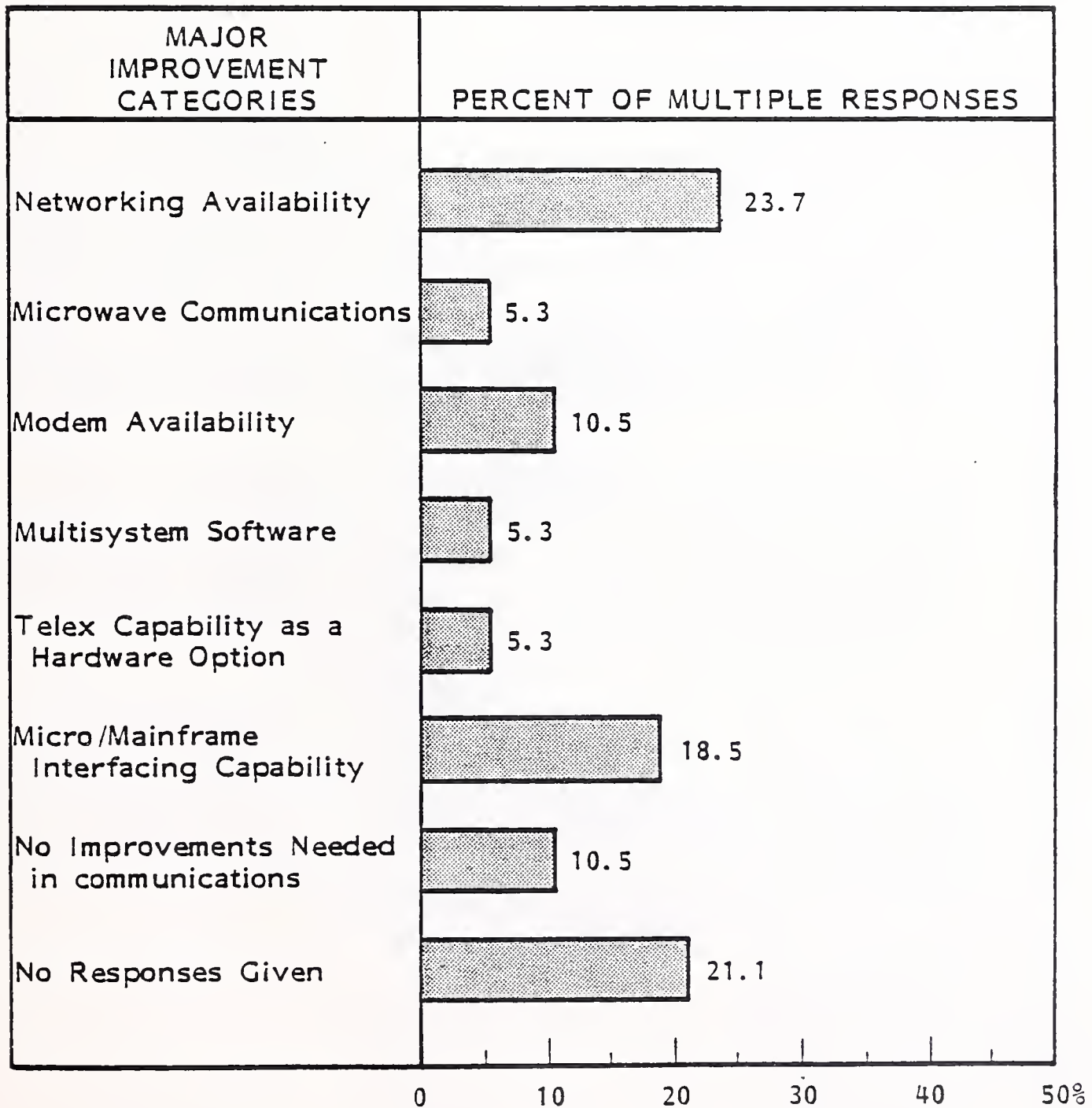
# EXHIBIT III-13

## HARDWARE IMPROVEMENTS NEEDED



# EXHIBIT III-14

## COMMUNICATIONS IMPROVEMENTS NEEDED





reduced as the user body increases and brings about technological and competitive change.

## 2. SOFTWARE

- The two areas needing the most improvement, as shown in Exhibit III-15, are:
  - Quality of software.
  - Level of user friendliness.
- The issue of quality relates to the number of bugs or errors found within applications software packages. The personal computer market has been inundated with software created by individuals and very small companies attempting to take advantage of the boom in the personal computer market. As a result, the care taken to debug these products has been poor in many cases.
- User friendliness refers to a software package that requires virtually no computer experience to use it. It is often tutorial in nature, meaning that the software provides step-by-step operating instructions as well as corrective remarks and alternatives when mistakes are made.
- The producers of applications software are recognizing these problems and their impact on personal computer use. The quality, user friendliness, and documentation are improving as vendors realize that users are increasingly making buying decisions based on those factors.

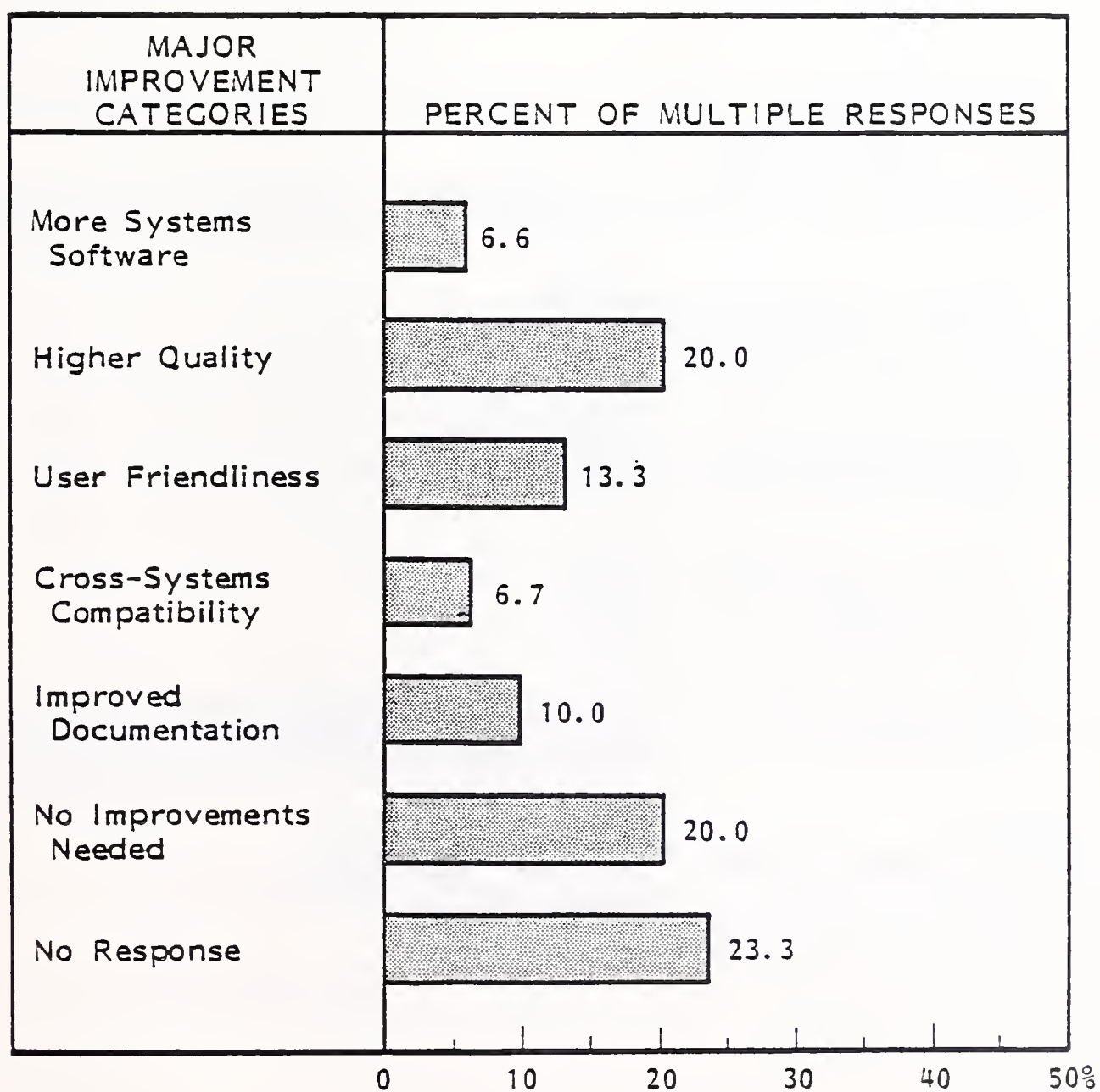
## 3. MAINTENANCE

- The majority of this survey's respondents indicated that no maintenance improvements were needed. Many respondents stated that no maintenance had been required on hardware since its original purchase date. The state of hardware reliability is apparently very high, as shown in Exhibit III-16.



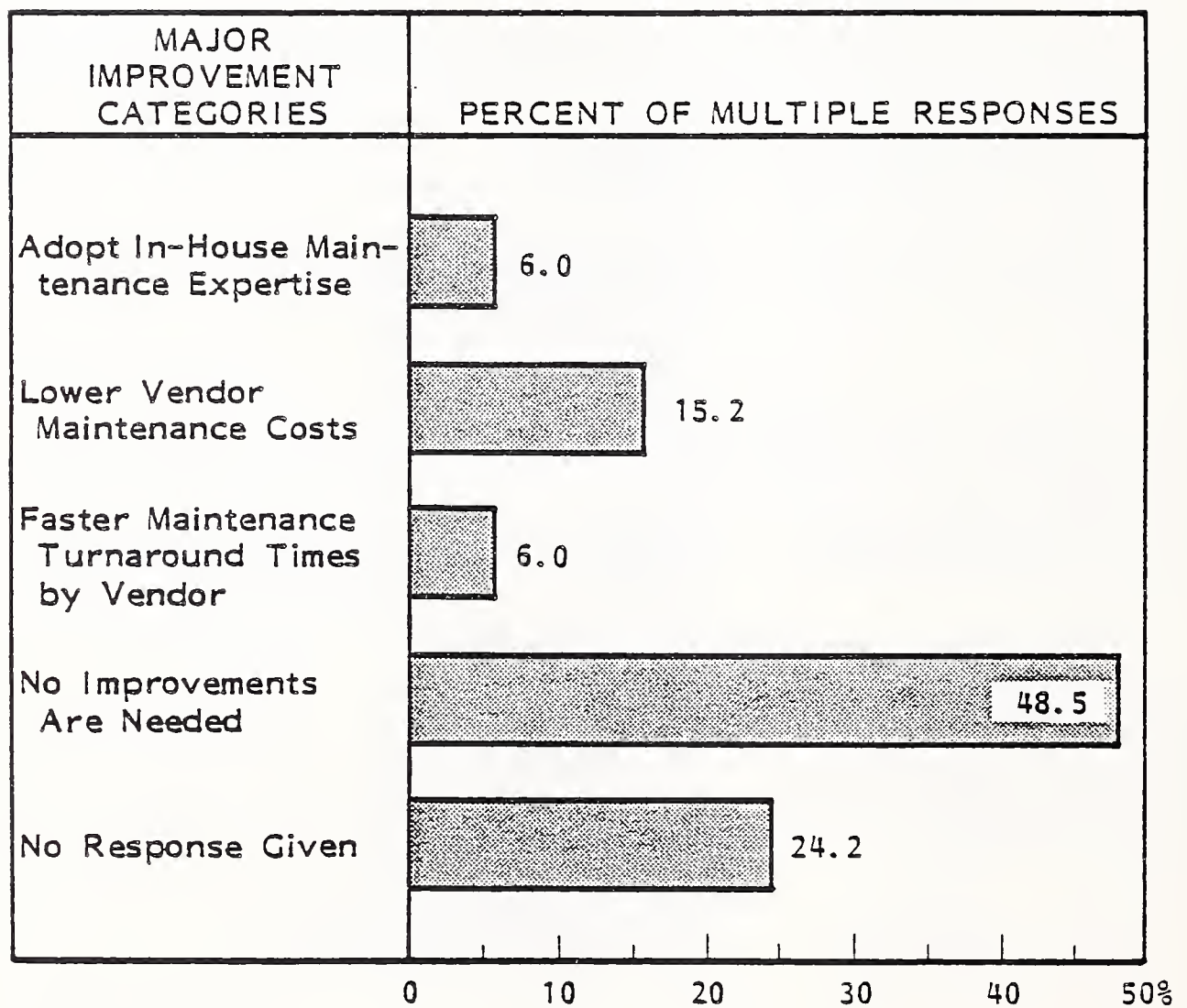
# EXHIBIT III-15

## SOFTWARE IMPROVEMENTS NEEDED



# EXHIBIT III-16

## MAINTENANCE IMPROVEMENTS NEEDED



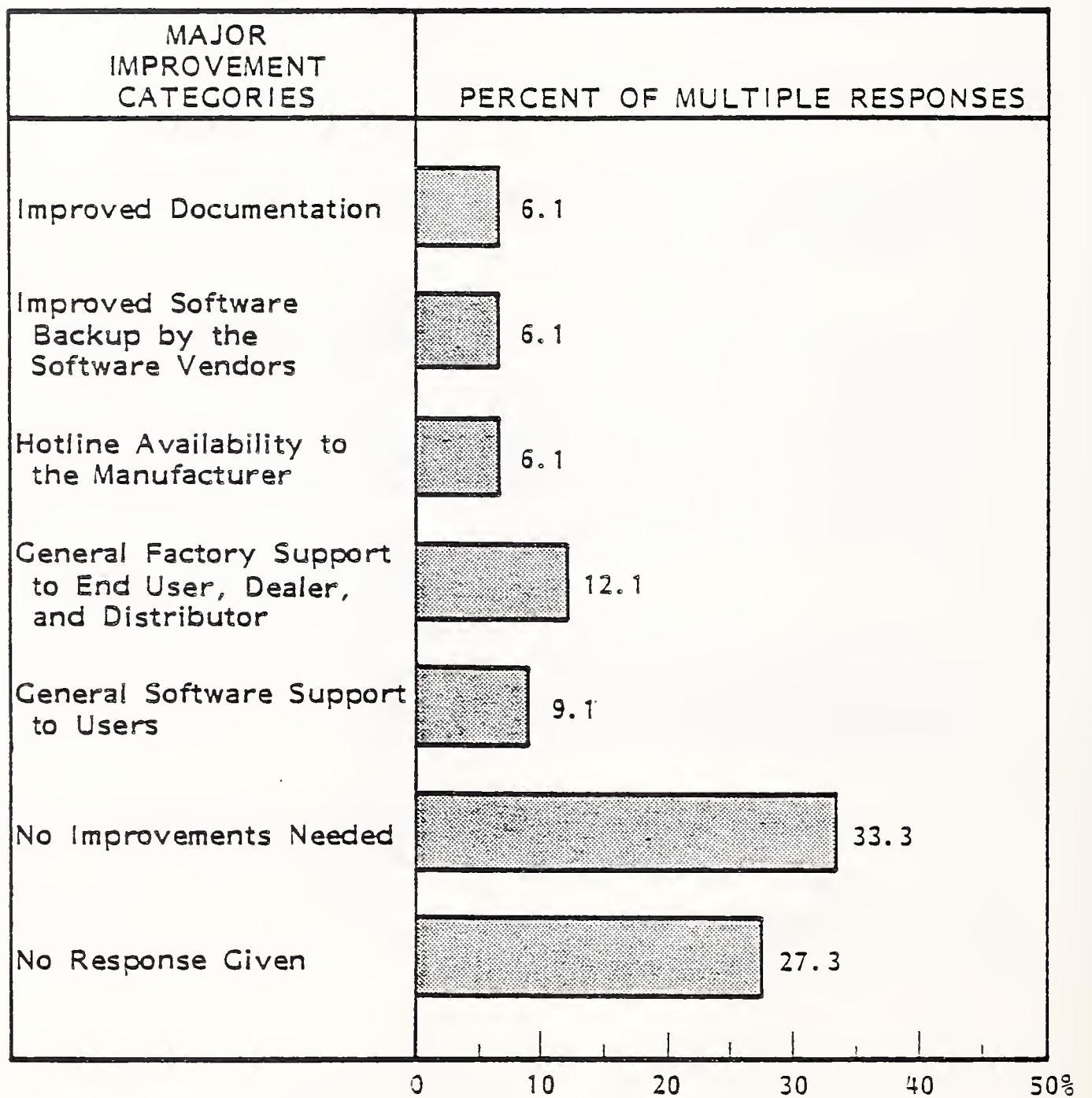
- Areas of improvement which do exist are lower cost of maintenance when it is needed, faster turnaround time, and the adoption of in-house maintenance expertise, which is a reaction to high costs and slow turnaround time.
- Maintenance cost, which is directly tied to labor costs, will continue to increase over the years.
- Turnaround times faster than 48 hours are not likely to come from the retail computer stores. In fact, the opposite is more likely.

#### 4. SUPPORT

- The majority of responses indicated that no support improvements are needed, as shown in Exhibit III-17.
- Most users of personal computers are reasonably pleased with the hardware, software, documentation, maintenance, training, and vendor interface. This may indicate that users are aware of the rapid improvements being made in the industry and that they expect their considerations to be dealt with as a natural function of development.
- The natural development of the industry has taken nearly all of the vendors' woes into account, such as documentation and improved software. An area that needs further attention is user training.
  - Many users have taken on the task of training themselves and those who work within the company. It is questionable whether or not this in-house training is adequate. Does it train an end user to be completely versatile? It probably does not.
- Professional vendor training not only gives the end user greater accomplishment and satisfaction with the personal computer, it also creates loyalty and ensures future sales.

# EXHIBIT III-17

## SUPPORT IMPROVEMENTS NEEDED





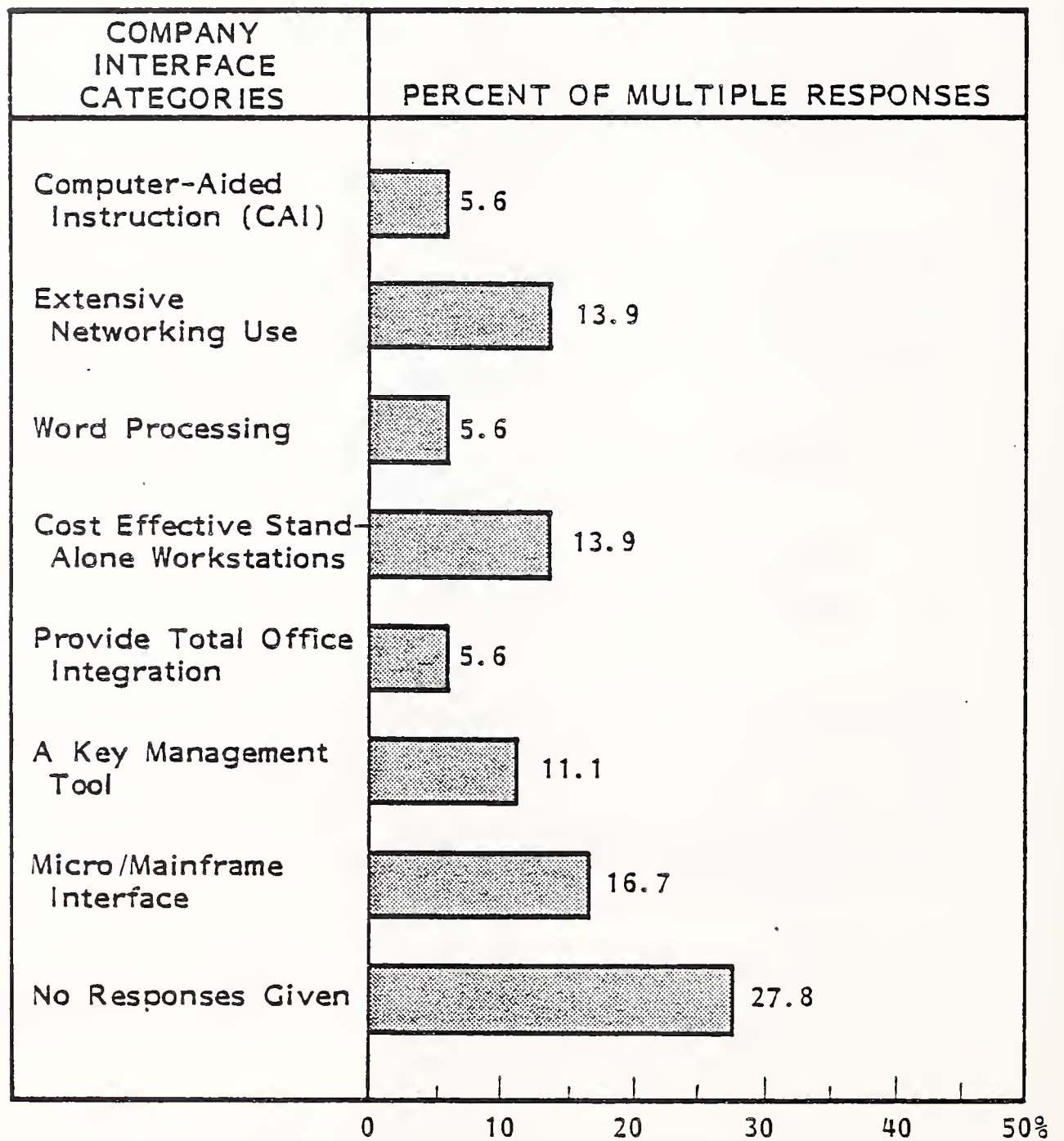
## 5. INTERFACING PERSONAL COMPUTERS WITH COMPANY/DEPARTMENT OPERATIONS

- The ways in which personal computers will interface with company/departmental operations are micro to mainframe interfacing, extensive networking, as standalone workstations, as management tools, in office integration, and in computer-aided instruction, as shown in Exhibit III-18.
- Micro/mainframe interface is desired to allow for access and storage capability of a mainframe by a micro. This enables a personal computer to become a much more powerful tool, utilizing its accessibility while providing central control and distribution of data generated by the mainframe.
- Networking within a department and company provides the ability to share data on a broader scale without having to retrieve and enter into a mainframe when data is simply being distributed to one or more workstations.
  - Programs can also be worked on simultaneously.
  - Networking also enables several workstations to access common data bases.
- The personal computer as a management tool has not seen its true potential yet. It will enable managers to analyze their department or company and make plans with greater ease. Efficiency and productivity are the two greatest benefits.
- The personal computer is beginning to integrate the office environment already. Word processing, electronic mail, communications, and filing are all being done on the personal computer.
- Finally, computer-aided education in schools and businesses is already a reality and will be expanding.



# EXHIBIT III-18

## FUTURE INTERFACE OF PERSONAL COMPUTERS AND COMPANY OPERATIONS



## F. IMPACT OF PERSONAL COMPUTERS ON PROCESSING SERVICES

### I. INTERACTIVE TIMESHARING

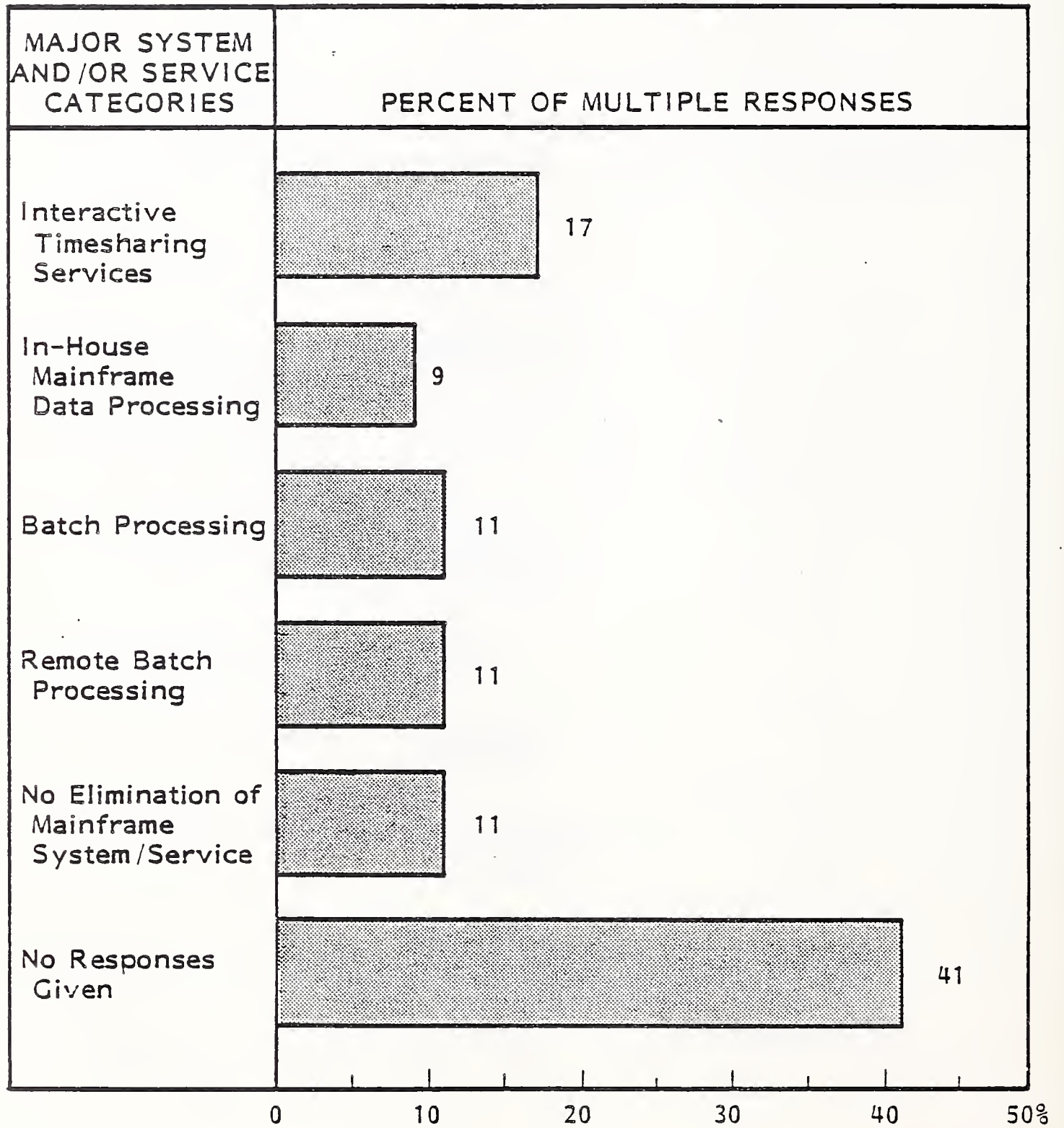
- Several respondents stated that within their company the interactive time-sharing services would eventually be replaced by personal computers, as shown in Exhibit III-19.
- With the continual improvements taking place in the power, speed, and sophistication of personal computers, some expensive timesharing services are seen as becoming obsolete.
- INPUT does not feel RCS will become totally obsolete by any stretch of the imagination. However, it is felt that personal computers will replace RCS in many situations where low-volume, professional, managerial, general office, and communications functions can be swiftly and effectively handled by personal computers. Applications which will switch from RCS to personal computers are:
  - Repetitive.
  - Static.
  - Single-person.
  - Small data base.

### 2. BATCH PROCESSING

- Four respondents indicated that batch processing would be replaced by personal computers.

# EXHIBIT III-19

## LARGE COMPUTER SYSTEMS AND/OR SERVICES REPLACED BY PERSONAL COMPUTERS



- Supplementation as opposed to total replacement is a more realistic assessment of the personal computer's impact upon batch processing. Two factors affect the extent of this supplementation:
  - The volume of processing required by the user.
  - The turnaround time needed by the user. Cost of batch versus personal computer is also a factor; however, it is overridden where volume is large and time is short.

### 3. REMOTE BATCH

- As with batch processing, four respondents stated remote batch processing services would be eventually replaced in their companies by personal computers.
- Personal computers will have a far greater impact on remote computing services in small business environments due to the smaller processing volumes of small businesses. Lower cost will be the primary motivator for small businesses turning to personal computers.

### 4. IN-HOUSE DATA PROCESSING

- Three respondents indicated that they were using the personal computer instead of the in-house facilities previously used.
- In large companies processing provided by mainframes will be supplemented by personal computer processing.
  - Where limited amounts of data are involved, users will bring up applications on personal computers.
  - With large data bases, users will download segments of the data to be analyzed and processed on their personal computers.

- Many small businesses are turning to personal computers for all of their EDP needs. In many cases, the hardware and software capabilities of these systems will grow with the businesses.
- For the most part, the personal computer will not replace in-house mainframes as much as they will expand the applications which may be practically addressed by end users.



#### IV DISTRIBUTION CHANNELS AND MARKETING ISSUES



## IV DISTRIBUTION CHANNELS AND MARKETING ISSUES

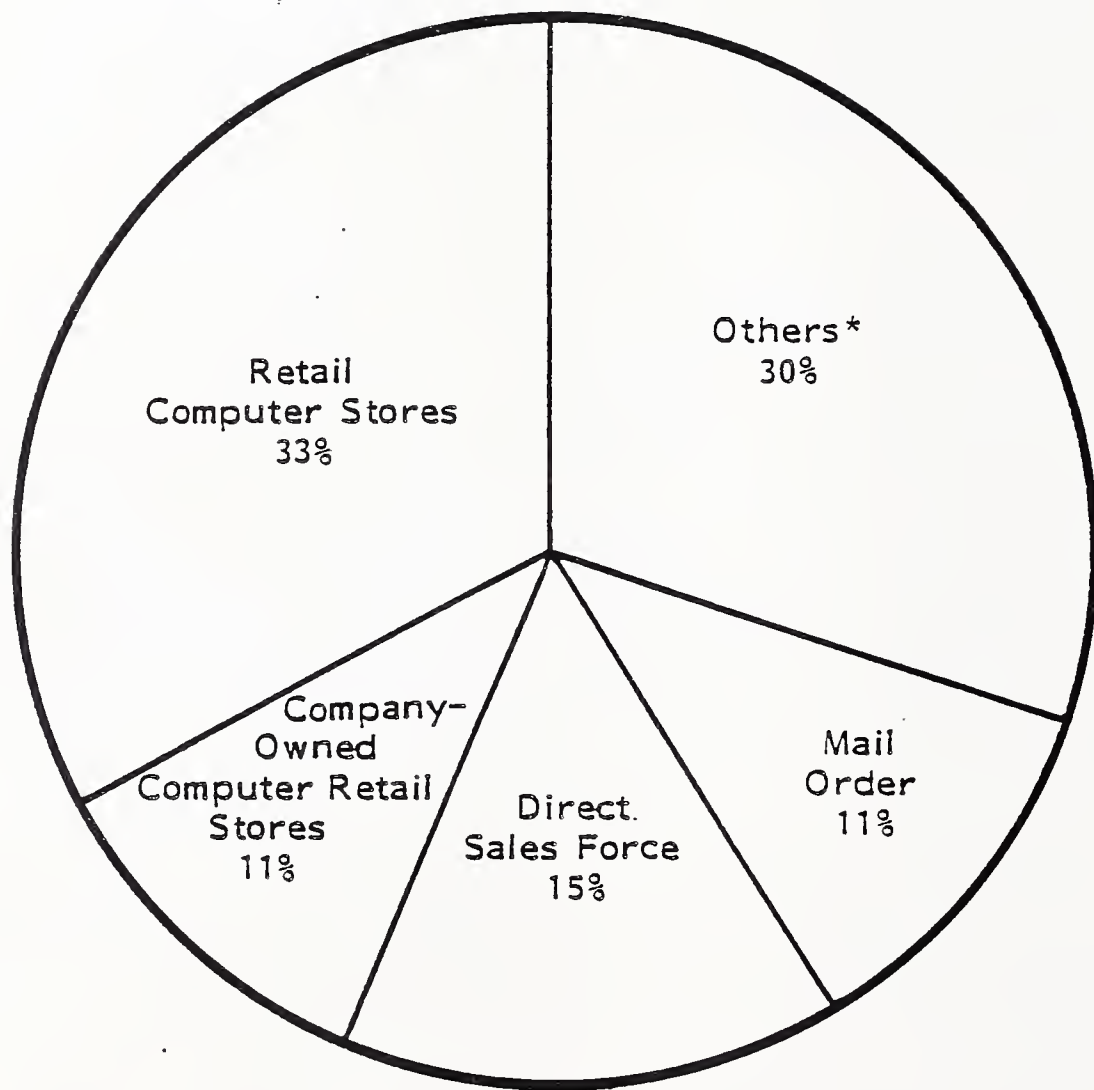
### A. HARDWARE MARKETING

#### I. DISTRIBUTION CHANNELS USED

- INPUT's survey of distribution channels indicates an emphasis on the retail computer store as the channel used most often by hardware vendors in the selling of personal computers. As a result of the acceptance of retail computer stores by the user public and, more significantly, by the business community, retail computer stores will remain the primary channel for hardware distribution over the next five years.
- As shown in Exhibit IV-1, distributors of various types are also major channels of distribution for hardware. Distributors tend to service vertical sectors requiring a more integrated personal computer system.
- The exhibit has been developed from multiple responses given by the 18 vendors interviewed. Therefore, it represents those respondents interviewed and not the entire vendor population and illustrates a variety of distribution channels used by single vendors.
- Out of the six personal computer manufacturers interviewed, three stated that the most successful distribution channel, in terms of percentage of sales, is the retail computer store. Two of the six manufacturers sell integrated small

EXHIBIT IV-1

DISTRIBUTION CHANNELS BEING USED BY VENDORS



Percent of Multiple Responses

\* Others are OEM distributors, industrial distributors, office supply distributors, etc.

business systems and therefore market their products primarily through OEMs and distributors.

- It must be noted that most personal computers sold today are nonintegrated and are most commonly sold through retail outlets, the most significant of which are, again, the retail computer stores.
- Mail-order distributing has created highly competitive hardware pricing in densely populated areas where there are an abundance of retail outlets to be found. The competition has had several key effects:
  - Price competition between retail computer stores has increased, resulting in narrower profit margins.
  - Narrow profit margins have resulted in a general shakeout within the retail computer stores industry.
  - Retail computer stores have become sensitive to those potential customers who intend to buy through mail order or other retail outlets.
  - Narrow profit margins have caused a decline in dealer service to the user and a decline in level of professional salesmanship within the store.
  - Lack of professionalism and service on the part of the retail store has in turn created a "buyer beware" attitude on the part of the user.
- Apple, in a move to counteract the effects of the mail-order distributing method on the retail computer stores, has restricted the selling of the popular Apple computers by mail order.
  - Apple has taken the position that retail outlets must be preserved and allowed to increase their profit margins in order to provide the necessary service and education to users.



- Service and education are viewed as critical elements in maintaining user interest and the corresponding development of the personal computer marketplace.

## 2. PRODUCT FEATURES EMPHASIZED

- All 18 vendors were asked to name the most important feature(s) of their personal computer products. In descending order, the user considered the most important features to be:
  - Price.
  - Features (software availability and peripherals).
  - Service.
  - Reputation of the manufacturer.
  - Reliability.
  - The size of the personal computer and its peripherals.
- The price of the personal computer will continue to drop relative to the additional processing capability and memory capacities that are being offered now and will be offered over the next several years. The Motorola 68000 CPU is the prime example of this "more power for the dollar" trend in the industry.
- The software which has popularized personal computers can be summed up in one word: "VisiCalc." VisiCalc is being challenged by more sophisticated analysis packages and a marketplace which is beginning to demand more error-forgiving and flexible software.
- Service and reliability can be talked about simultaneously by simply stating that personal computer hardware is so good it seldom requires service.

- The product features that will be most important in drawing users to personal computers over the next decade will be:
  - Improved applications software.
  - Faster processing coupled with increased memory capacities.

### 3. MARKET OBSTACLES

- The obstacles encountered most often in the selling of personal computers according to the survey respondents are:
  - The lack of user computer literacy.
  - The intensely competitive environment resulting from an overabundance of personal computer vendors.
  - The inability of vendors to properly evaluate the ever-increasing number of software packages being generated by software producers.
- The lack of user computer literacy burdens the computer vendor with having to invest in lengthy orientation sessions with the user and with training sales people so they can deal with unknowledgeable users in a professional and successful manner.
- The highly competitive retail environment has hampered the ability of vendors to provide the service and expertise sorely needed by the users of personal computers, thus creating user frustration.
- The tremendous amount of packaged software has made it impossible to evaluate, recommend, and determine those software producers who offer consistently high-quality products. It has also made it difficult to identify the trendsetters in the industry and to establish business relationships with those potentially key companies who stand to further the software market.

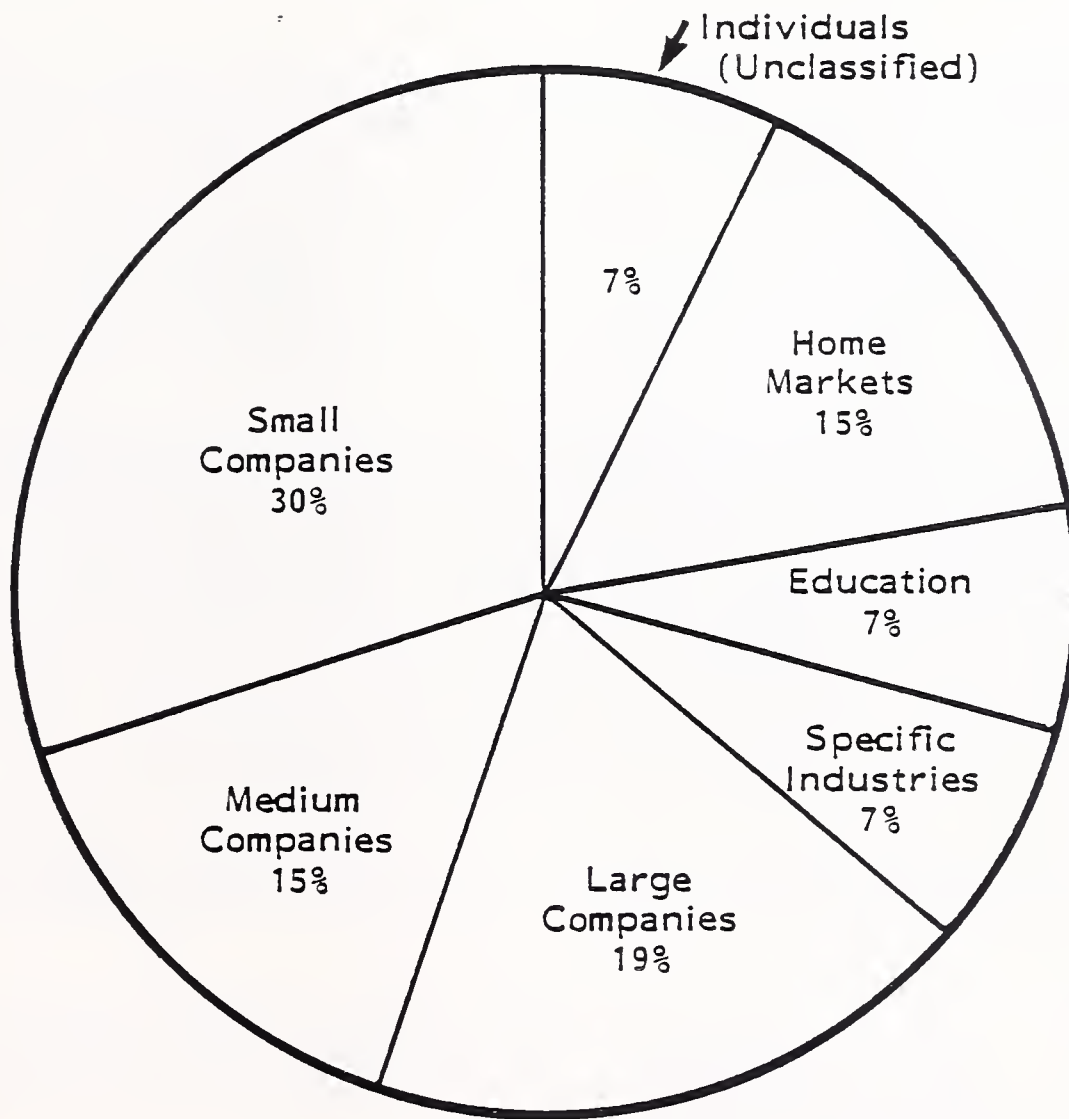
- Computer illiteracy will remain a marketing obstacle throughout the 1980s.
  - Schools, homes, and businesses will provide the environment needed to educate students and parents.
  - By the end of the decade, many school districts across the U.S. will require computer classes as a prerequisite to graduation from high school.
  - Many colleges already require basic undergraduate courses in programming.
  - The business world now requires that all levels of management and many hourly workers have a working knowledge of computers.
- Profit margins for personal computer hardware will continue to shrink. Software, however, with its very high profit margin, will be the mainstay of the retail computer store industry. Opportunity lies in creating retail outlets which sell software only, with the necessary computers on hand for demonstrations only. This will allow salespeople to develop expertise regarding a much wider variety of software than is now possible.

#### 4. MAJOR BUYER CHARACTERISTICS

- The major buyer characteristics are illustrated in Exhibit IV-2. The exhibit is divided according to multiple responses given by all 18 personal computer vendors interviewed.
  - Small business was characteristic of the major buyers of personal computers. This is not surprising because of the accounting and record keeping needs that have largely been handled manually in the past.
- Medium and large businesses are the next two large categories of personal computer buyers. Within large and medium businesses, many applications are

EXHIBIT IV-2

MAJOR CHARACTERISTICS OF CUSTOMERS



Percent of Multiple Responses

being met at all levels. The primary motivators for using personal computers in these two categories are accessibility, flexibility, and cost.

- Homes and schools are two potentially major markets that will increase in importance during the 1980s. This will be due to an increase in computer literacy and a direct result of on-the-job training and curricular demands of the schools.
- Small businesses will continue to buy the most personal computers. Personal computers are becoming more powerful, and financial modeling, word processing, forecasting, and other applications software is becoming more and more sophisticated. In order to cut costs and increase efficiency and productivity, small companies, especially, will be forced to depend on computers.
- Given the demand and size of the business market in general, a dealer who catered to small- and medium-sized businesses only would find itself extremely competitive with retail computer stores, which cater to a broader customer/prospect base.

## 5. VENDOR ASSESSMENTS OF MARKET REQUIREMENTS

- Determining customer needs, for the most part, depends on direct interfacing with the customer.
  - For the manufacturer, the "customer" includes the distributor, retailer, user, and end user.
  - Therefore, the manufacturer employs several different techniques to determine customer needs.
  - For example, to determine user needs, the manufacturer may employ on-site testing and distributor feedback through seminars held monthly, direct salesforce feedback, customer hotline, and expertise within the



manufacturing establishment. Seminars are likely to be used for determining dealers' and distributors' needs as well.

- The INPUT study showed that the selling process, if conducted properly, is one in which the application needs, cost, processing volume, company growth (if applicable), and avoidance of obsolescence are determined. This interfacing process creates a valuable source of feedback as well as providing the user with what is needed.
- Vendors are advised to keep in close touch with their customers' needs.
  - User surveys three to six months after a product is sold are highly recommended.
  - Periodic surveys of retail salespersons should also be conducted by vendors.
- In addition to their own surveys, vendors should retain independent firms to conduct surveys of buyers of competitive products.

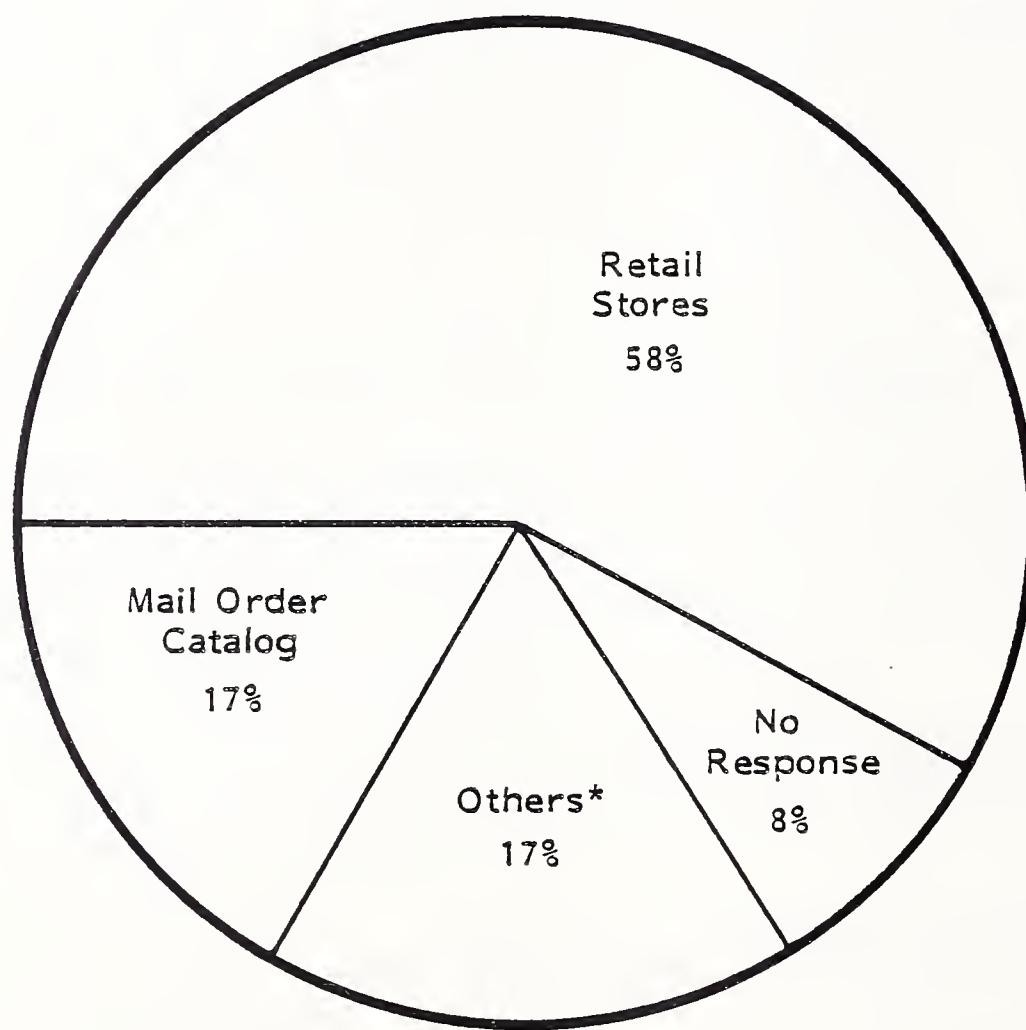
## B. SOFTWARE MARKETING

### I. DISTRIBUTION CHANNELS USED

- As shown in Exhibit IV-3, retail stores are the major channel of distribution for software as well as hardware.
  - Retail stores, of course, offer the natural setting for software's major role in the marketplace, allowing users and dealers easy hands-on access for demonstrating and selecting a large variety of packaged software.

EXHIBIT IV-3

SOFTWARE DISTRIBUTION CHANNELS USED BY VENDORS



16 Respondents

\* Others are industrial distributors, direct distributors, and OEM distributors.

- Floppy disk, packaged software lends itself to a variety of retail distribution channels, and although one would expect the retail computer store to maintain its importance in distribution, other retail distribution channels could very well become significant outlets in the future.
- As the quality of software improves in terms of error removal (quality control/assurance), and well-controlled backup systems are developed by mail-order houses, it is conceivable that mail-order distribution could become more popular.
- An increase in the popularity of mail order will be directly related to the cost savings of ordering by catalog. Sales may also be stimulated by the increasing prices of software during the next few years.
- The "others" category includes that portion attributed to software sold by OEMs, distributors, and one hardware/software manufacturer. The "others" category actually sets aside those companies offering fully integrated or turnkey systems. Although this category is significant because of its tendency toward vertical markets, its overall volume of software units sold could not be expected to match that of the retail distribution channels. Integrated systems have a much longer, more complex sales cycle than do similar standalone units.
- Two advantages for a business of buying from a systems integrator are the amount of software expertise available and the variety of maintenance methods. Remote diagnostics, hotline, and on-site services are often available through a systems integrator.
- Retail channels distributing packaged software could change drastically during the next 10 years. As standard packages are perfected and drop in price, there will be an increase in outlets such as supermarkets, drugstores, and large shopping malls.

## 2. 16-BIT VERSUS 8-BIT SOFTWARE

- As the personal computer industry makes its transition from 8-bit to 16-bit machines, the greatest lack will be in 16-bit software.
- The 8-bit machine will remain popular and a force in the marketplace due in large part to the enormous amount of software available for it.
- The opportunity with the more powerful 16-bit machines is to begin developing sophisticated applications software that takes advantage of the Intel 8086 and Motorola 68000 CPUs.
- It should be noted that there is already software available for the 16-bit machines written for M/PM and Unix in COBOL, FORTRAN, PASCAL, and other languages. However, conversion of this software to the smaller personal computers requires that user friendliness is designed into them so that they become practical for the majority of personal computer end users.
- Exhibit IV-4 is a conceptual illustration of the approximate life cycles of the 8-, 16-, and 32-bit machines. Hard data is not currently available on these life cycle relationships. The shorter life cycle of 16-bit machines will be due primarily to the relatively early introduction of 32-bit processors.

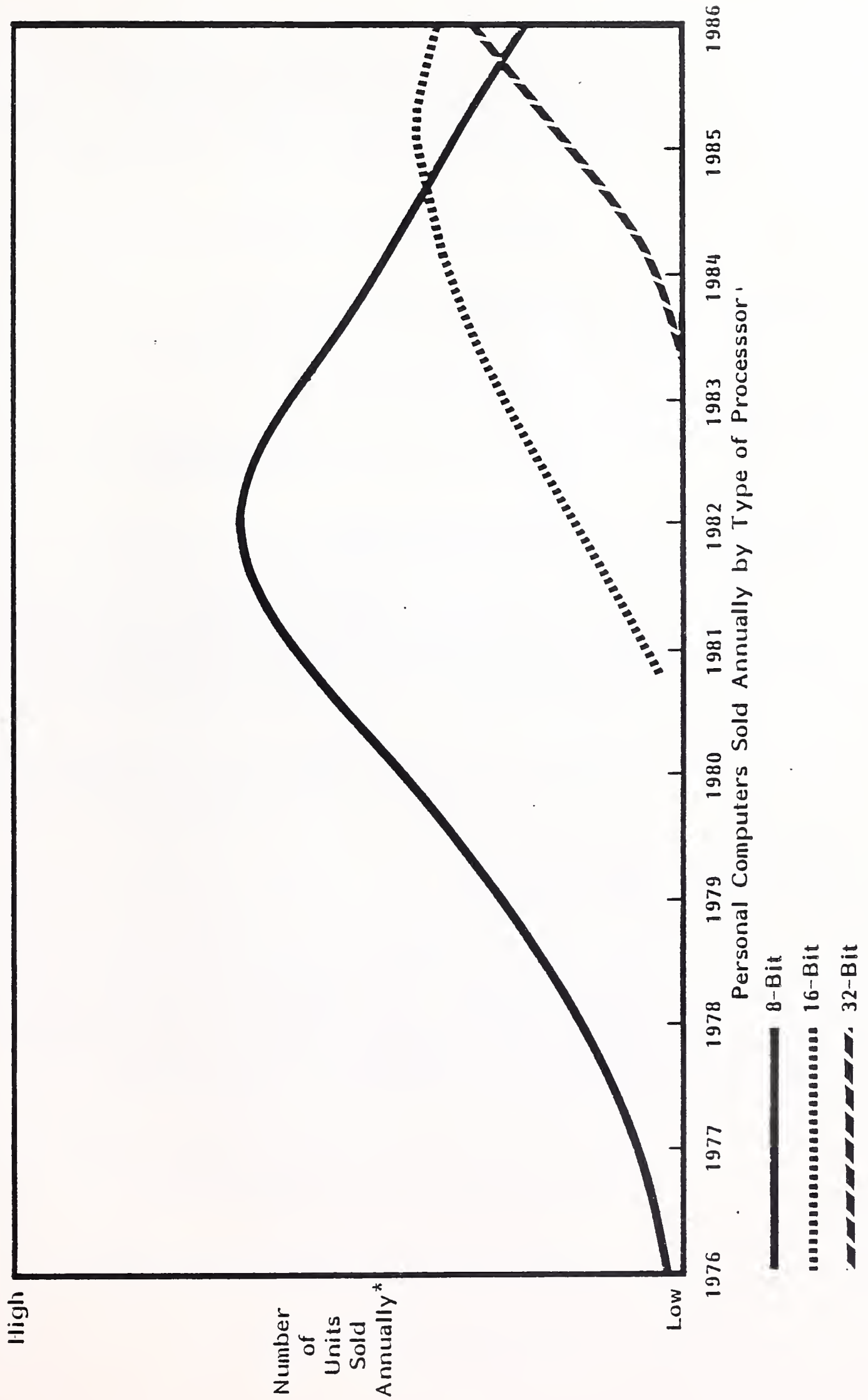
## C. SUPPORT SERVICES

### 1. PROFESSIONAL SERVICES OFFERED

- Professional services are being offered to some degree by seven of the eighteen respondents to INPUT's survey.

# EXHIBIT IV-4

## LIFE CYCLE OF PERSONAL COMPUTERS BY PROCESSOR TYPE



\*Exhibit is conceptual. Not based on actual data.



- Of the seven companies offering professional services, it is no surprise to find that systems integrators and manufacturers offer the most extensive service to their customers and users. Their service entails:
  - Training sessions and materials.
  - Applications consulting.
  - Custom programming.
  - On-site and in-house training seminars.
  - Processing consulting.
- For the most part, systems integrators, manufacturers, and retail stores restrict their professional services to business customers and buyers of multiple systems.
- As business and education adopt personal computers into their operations more extensively, the opportunity for professional services will increase.

## 2. USER TRAINING

- Basic computer operations training is provided to the user by 13 of the 18 vendor respondents. Four respondents answered "no" to providing any training, and one respondent gave no answer to the survey question. Those respondents answering "no" to the question are manufacturers.
- Retail computer stores and systems integrators offer a variety of user training programs. The basic programs are as follows:
  - Manuals and limited salesperson assistance.
  - One-on-one, in-house training.

- On-site and in-house group seminars.
  - On-site orientations of turnkey systems and specific applications packages.
  - Company classes.
- A continuing effort is needed to overcome the computer illiteracy problem existing among the majority of potential personal computer users.
  - The lack of familiarity of users with computers has a direct effect on hardware units sold every year.
  - INPUT recommends that manufacturers accelerate user training to prepare for future acceptance by home and school users.
  - This will be especially important to companies who will be challenged to compete with IBM, DEC, and HP.

### 3. MAINTENANCE

- Direct user maintenance is provided by all retail computer stores and systems integrators interviewed by INPUT. The maintenance takes various forms, often depending on whether or not the equipment is under warranty.
- Many retail computer stores have been forced or have chosen to deny maintenance to users who have not purchased a computer from that particular store. This tactic is primarily an effort by the retailer to discourage users from buying hardware through mail order catalogs at discount prices.
- A variety of maintenance practices are being employed:
  - Retail stores usually require that a unit be carried in.

- They charge anywhere from 1% to 18% of original purchase price per visit or \$35 to \$55 per hour.
- If the repairs are not serious, a 48-hour turnaround time is typical. A wide variety of service contracts are offered with no real standards in evidence.
- Systems integrators provide on-site service at \$45 to \$55 per hour on the average. Several types of service contracts and warranties are offered as well. Remote diagnostics is also a feature being offered as an option for some systems.
- There is a clear opportunity for service/maintenance only vendors.
  - Working with retailers and manufacturers, a very effective, highly service-oriented bureau could be established whose purpose is to adequately service and care for those users with personal computer systems.
  - Professional services as well as maintenance would be a natural combination within this bureau.
  - This service-oriented arm of the industry would lend tremendous credibility and professionalism to the industry.

#### D. PRODUCT DEVELOPMENTS

- All 18 participants in the INPUT survey were asked the question, "What improvements are needed to increase the acceptance of personal computers?" Each respondent had the opportunity to answer this question within six different categories. Then, within each category the respondent was allowed

to give a multiple response so as to reveal several potentially key areas of improvement. The six categories are as follows:

- Hardware.
- Communications.
- Maintenance.
- Support.
- Software.
- User training.

#### 1. HARDWARE AND COMMUNICATIONS

- The hardware and communications sections have been lumped together because it is not possible to discuss the improvements needed in communications without including a similar discussion of the hardware needed to effect the improvements.
- Vendors viewed user friendliness as the important improvement most needed to increase personal computer acceptance during the next few years. User friendliness needs to be expressed in terms of human engineering. The areas of needed improvement are:
  - Keyboard design and standardization.
  - Voice command capability.
  - Portability.
  - Touch screen capability.

- Operating documentation for inexperienced users.
- Faster processing capability (now being made possible by the more powerful 16-bit CPUs).
- For communications, the four areas of improvement most mentioned during the survey were:
  - Networking.
  - Microcomputer standardization.
  - Telecommunications software.
  - Modem availability.
- Personal computer hardware and communications capabilities will undergo rapid enhancements in the next few years.
- Networking, remote data base accessibility, mainframe interfacing, telecommunications, remote diagnostics, and user diagnostic capability are about to become commonplace in the personal computer world.
- The most critical factor, perhaps, in assuring the timely development of increased personal computer capabilities is to provide these enhancements in a design structure that is usable, practical, and friendly to the greatest possible number of users.

## 2. MAINTENANCE

- The main concern of vendors interviewed is the improved ability of the users to perform hardware and software maintenance themselves. Maintenance costs to both user and vendor will be drastically reduced as vendor products increasingly lend themselves to self-maintenance.



- Some of the important improvements needed to begin realizing this objective are:
  - Component level maintenance design.
  - The existence of spare parts depots.
  - Systems modularity design.
  - User and remote diagnostics capabilities.
- Despite the desirable improvements mentioned, personal computer hardware has achieved outstanding reliability in a very short period of time.
- Interestingly enough, maintenance rates for personal computers seem to be following the pattern common to minis and mainframes: high rates that are increasing.
  - The opportunity is to create maintenance-dedicated service outlets that can operate at a profit and provide professional services at reasonable, stable rates so as not to discourage small users from buying computers to manage businesses and/or personal affairs.
  - Small service operations could easily service fairly substantial territories and share the customer base with a number of other service outlets in densely populated business and high-technology manufacturing areas.
  - This is an ideal time to pursue such a venture. The opportunity is available, and hardware manufacturers are anxious to provide excellent service to users and unburden retail computer stores where needed.

### 3. SUPPORT

- User education was the category mentioned most frequently as needing improvement. The personal computer industry is aware that the lack of user education translates into units not sold, therefore, it can be said that user education is a key factor in the health of the personal computer industry.
- The remaining categories of improvement that were mentioned are dealer professionalism, and improved hardware and software documentation. The high employee turnover rate in retail computer stores has resulted in significant customer dissatisfaction and costly training time spent by the store management, all of which has resulted in a very unprofessional image for a good portion of the retail computer industry.
- Software and hardware documentation is very inconsistent across the personal computer industry. Its importance lies in that many times it is the only source of reference for users in business and in the home.
- User education regarding personal computers may be the single most important issue facing the industry. The majority of people in the U.S. still have little or no experience with computers. It is now obvious that applications are needed for computers in every aspect of business, education, and home.
- There is a very large application potential and fairly powerful computers are now very affordable. So why is the personal computer not exploding at even greater rates than is now being experienced? The answer is fear of the unknown!
- Education must continue to be this industry's major priority.
- The education business is a great financial opportunity, and it will contribute directly to consistent growth of the personal computer industry throughout the late 1990s.

#### 4. SOFTWARE

- The improvements needed for software are as follows, in descending order of importance according to the survey respondents:
  - User friendliness.
  - Software quality.
  - Improved documentation.
  - Increased systems sophistication.
  - Increased magnetic storage density.
  - Cross-systems capability.
- Two of the major drawbacks to personal computer use are the programming and hands-on time required for the typical user to achieve the desired result for which the personal computer was purchased in the first place. This is especially an issue in business where high salaries are paid for problem-solving, not programming.
- Software documentation needs to be comprehensive and aimed at the first-time user. Alternative documentation may be designed for more experienced users.
- Sophisticated personal computer software is now possible with 16-bit CPUs. The opportunity exists for applications, systems, and operations type software.
- Cross-systems capability depends upon standards being agreed to within the industry; i.e., operating systems, CPUs. True compatability may never be achieved, but practical compatability with a large variety of machines could be realized within five years.

- Clearly, the greatest opportunity and challenge within the software industry is to develop truly sophisticated applications software for applications such as accounting, human resources, manufacturing control, financial planning, and general ledger.
- The challenge will be to develop the packages in such a way that the ordinary person will be able to utilize them without the need of a computer science degree.

## 5. USER TRAINING

- The response to the survey question, "What improvements are needed in terms of user training" was very limited and did not reveal any critical areas in user training.
- The INPUT survey of personal computer vendors received only four responses, all of which indicated the need for tutorial software development.

## V MARKET FORECAST AND RECOMMENDATIONS





## V MARKET FORECAST AND RECOMMENDATIONS

### A. PERSONAL COMPUTER EQUIPMENT EXPENDITURES

#### I. INTRODUCTION

- Over the next five years we will witness some of the most revolutionary changes in the computer services industry since mainframe computers were first introduced in the early 1950s. The personal computer will become ubiquitous in American and worldwide society, but this does not imply that the markets will be saturated by 1987.
  - The impact on computer service firms will be great; for many of them the advent of the personal computer will represent tremendous opportunity.
  - For others it represents a serious threat to business.
  - Changes introduced by the personal computer are important to the success, in some cases the survival, of computer services vendors.
- An important indication of the impact of personal computers can be seen by looking at projected user expenditures on these systems and at the number of units actually shipped in the U.S. and the rest of the world.

- In this study, INPUT will forecast user expenditures on personal computers for the next five years. (It is important to note that these are calendar year forecasts since many of the major participants in the personal computer industries have fiscal years other than calendar years.)
- Most of the research encompassed by this study is focused on the U.S. marketplace, and most of the detailed forecasts are for the U.S. marketplace.
- But the personal computer and personal computer software markets are definitely international. Therefore INPUT's starting point is to evaluate the market internationally.

## 2. WORLDWIDE PERSONAL COMPUTER EQUIPMENT EXPENDITURES BY MAJOR VENDOR

- The companies shown in Exhibit V-1 represent all the vendors in 1981 who had more than 5% share of user expenditures on personal equipment in the world. It should be noted that the user expenditures do not translate directly into vendor revenues.
  - Most vendors sell their product at wholesale, whereas the user is purchasing it at retail. Therefore, the user's expenditures will usually be greater than the vendor's revenues.
  - Tandy Corporation's revenues most closely reflect user expenditures because they are the major retailer of their systems as well as the manufacturer of the systems.
  - Some of the other vendors' revenues also translate directly into user expenditures because they sell directly to the end user.

# EXHIBIT V-1

## WORLDWIDE PERSONAL COMPUTER EQUIPMENT USER EXPENDITURES BY MAJOR VENDOR

VENDOR	CALENDAR 1981		CALENDAR 1982		1981-1982 PERCENT CHANGE	CALENDAR 1987		AAGR 1982- 1987
	DOLLAR MILLIONS	PERCENT	DOLLAR MILLIONS	PERCENT		DOLLAR MILLIONS	PERCENT	
Apple	\$460	21%	\$670	17%	46%	\$2,440	13%	30%
Tandy	510	24	805	20	58	3,900	21	37
Commodore	225	10	340	9	51	1,350	7	32
IBM	400	19	1,050	27	163	5,800	32	41
Subtotal	\$1,595	74%	\$2,865	73%	80%	\$13,490	74%	36%
Other	555	26	1,075	27	94	4,680	26	34
Total	\$2,150	100%	\$3,940	100%	83%	\$18,170	100%	36%

- This is especially the case where employee sales are involved. Vendors such as IBM and Apple provide strong incentives to their employees to purchase their own equipment.
- In 1981 Tandy had the largest market share at 24% of the total user expenditures of \$2.15 billion dollars, as shown in Exhibit V-1.
- INPUT's forecast for 1982 shows the IBM Corporation taking the lead in the market with a 27% share which it will maintain through 1987 when it will attain a 32% share of user expenditures in personal computers worldwide.
  - If one is surprised that IBM is the market leader in 1982, one may not realize that IBM has been in the personal computer business for several years. IBM's entry was not signaled by its introduction of the personal computer (PC) in 1981 but rather by its introduction of its 5100 Series several years ago and the subsequent introduction of its Displaywriter and its Datamaster models.
  - Worldwide user expenditures on these systems reached \$400 million in 1981. Of that \$400 million, a very small portion came from the IBM Personal Computer. The rest came from the other systems mentioned.
- IBM's approach to the market with a number of different systems in different configurations will continue through the decade. IBM's prospects for maintaining its lead in the personal computer marketplace are excellent.
  - IBM is expected to introduce a number of new products over the next two years which will enable it to compete in all phases of the market.
  - Within the next six months, IBM is expected to introduce a very low-priced system. It will be designed to compete with Atari type systems in the entertainment and home marketplace and against Apple II type systems in the business marketplace.



- In addition, IBM is developing a Motorola 68000-based system which may reach the marketplace within the next year.
- Even more dramatic developments are expected from IBM. By September 1983, INPUT predicts that IBM will announce a personal computer which will be capable of supporting a major portion of the 370 instruction set.
  - This personal computer will have much of the power of current model 138. It will be a 32-bit machine and will probably be offered in initial configurations of one megabyte to four megabytes of memory.
  - The machines will probably be shipped in the first quarter of 1984. IBM is expected to do very well with this new series of machines.
- Tandy Corporation is expected to maintain its second place position in user expenditures from 1982 through 1987. Tandy has demonstrated with its introduction of a Motorola 68000-based system that it is not a technological laggard and that it is prepared to bring in new products as required by end users.
  - Tandy has the advantage of having the largest captive distribution network of any personal computer vendor with its more than 8,500 outlets worldwide.
  - Tandy's merchandising talents are unequalled in the personal computer field. Its mailings of nearly 25 million fliers to homes in the United States, apparently on a monthly basis, will aid it much in its marketing of the personal computer.
- Whereas IBM will concentrate on the Fortune 1000 marketplace, Tandy will focus on the small establishment marketplace through its numerous small outlets throughout the U.S.

- Apple will move down to the third position of leaders in the personal computer business in 1982 and it is expected to maintain that position through 1987. Apple has yet to prove its technological staying power in the personal computer business, which is one of the reasons INPUT projects that it will continue in the third position. There are developments at Apple which could possibly change that assessment.
- Apple has yet to introduce a truly successful second product. The Apple III simply has not captured the interest of the marketplace as has the Apple II, which is still by far its best seller.
- Apple is expected to introduce a product (Lisa) which will be referred to here as the Super II. The Super II will be a much lower-priced version of the Apple II. Apple will introduce this system in January 1983.
- Apple's next-generation system (Macintosh) is based on the 68000 chip and is expected to be introduced in the first half of 1983. A tremendous amount of research and development has been invested in this system and its software, which is hoped will result in a superior machine. Hoped, because it will need to be superior to compete in a marketplace already inundated by machines based on the 68000 and other advanced chips provided also by Intel.
- Commodore is the fourth leading vendor in the personal computer industry, based largely on its overseas sales, particularly in Europe.
  - INPUT expects Commodore to continue strong in foreign markets and at the same time to expand its U.S.-based business.
  - Commodore's strategy will be to maintain the business base they currently have, largely home computers, while concentrating more and more on the business sector of the marketplace.

- The four vendors mentioned above, Apple, Tandy, Commodore, and IBM, together share about 75% of user expenditures today and are projected to continue that dominance of the marketplace through 1987.
  - The other 26% to 27% of the marketplace is shared by more than 100 vendors of personal computers.
    - Their share of user expenditures will increase from \$1 billion in 1982 to nearly \$5 billion in 1987. INPUT believes that of those vendors at least one or two will have more than a 5% share of the market in 1987.
    - INPUT does expect at least one of those vendors to be Japanese and another American. The American vendor could be any one of a dozen very promising entrants at this time.
  - Worldwide user expenditures will nearly double from 1981 to 1982 growing from slightly over \$2 billion to just under \$4 billion. From 1982 to 1987 user expenditures will more than quadruple, exceeding \$18 billion in 1987 for personal computer equipment. Obviously this growth represents a great deal of opportunity for many vendors.
    - Software vendors, in particular, are expected to benefit from the growth of the personal computer.
    - Software vendors should take note that IBM will be the leading vendor in that marketplace.
3. U.S. PERSONAL COMPUTER EQUIPMENT USER EXPENDITURES BY MAJOR VENDORS
- IBM is expected to become the leading vendor of personal computers in the U.S. marketplace in 1982, as shown in Exhibit V-2.

EXHIBIT V-2

U.S. USER EXPENDITURES ON PERSONAL COMPUTER EQUIPMENT  
BY MAJOR VENDOR

VENDOR	CALENDAR 1981		CALENDAR 1982		1981-1982 PERCENT CHANGE	CALENDAR 1987		AAGR 1982- 1987
	DOLLAR MILLIONS	PERCENT	DOLLAR MILLIONS	PERCENT		DOLLAR MILLIONS	PERCENT	
Apple	\$330	26%	\$475	18%	44%	\$1,690	17%	29%
Tandy	250	20	435	17	74	1,940	19	35
Commodore	55	4	95	4	73	390	4	33
IBM	275	22	700	27	55	3,025	30	34
Subtotal	\$910	72	\$1,705	65%	87%	\$7,045	70%	33%
Other	360	28	900	35	150	2,995	30	27
Total	\$1,270	100%	\$2,605	100%	105%	\$10,040	100%	31%



- Apple will gain a temporary lead in 1982 over its rival, the Tandy Corporation, but it will quickly lose that lead and not again attain second place.
- Tandy is projected to continue to be the second leading vendor of personal computers in the U.S. marketplace through 1987.
- Commodore is a distant fourth in the U.S. marketplace and will probably lose that position by 1987 to any of several other vendors, particularly Hewlett-Packard Corporation or Digital Equipment Corporation.
- User expenditures on personal computers in the U.S. will grow faster from 1981 to 1982 than they will in foreign markets, but this trend is expected to reverse itself soon. User expenditures will increase at a faster rate through 1987 in international markets than in the U.S.
- As in the world market, the U.S. market will present a great deal of opportunity since it will more than double from 1981 to 1982 reaching \$2.6 billion, and it will almost quadruple by 1987, becoming a \$10 billion marketplace. The overall growth of 31% per year in personal computer user expenditures from 1982 to 1987 will be a higher rate than for any other category of computing equipment including mainframes and minicomputers.

## **B. WORLDWIDE PERSONAL COMPUTER SHIPMENTS**

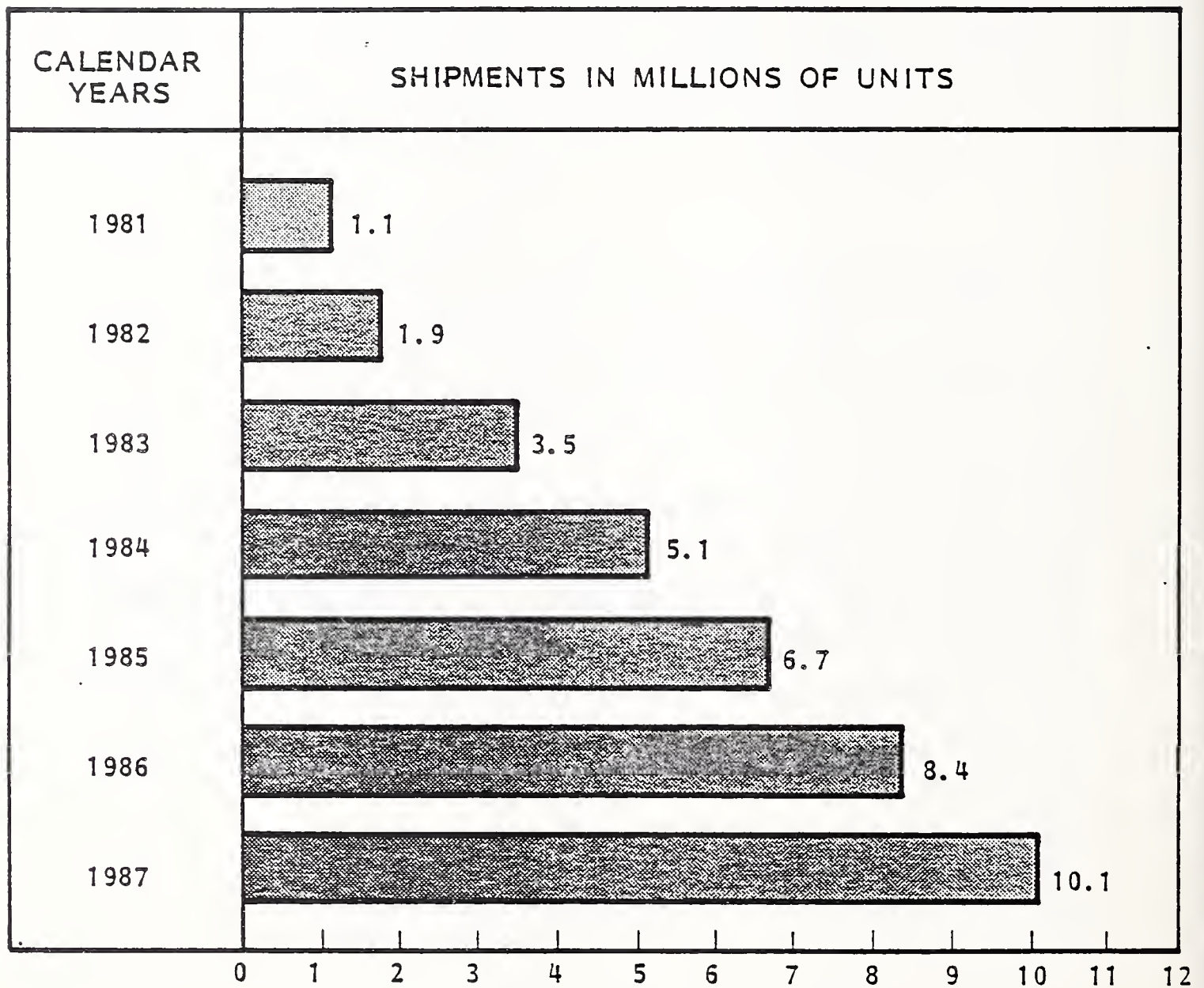
### **I. ANNUAL WORLDWIDE SHIPMENTS**

- Worldwide annual shipments of personal computer systems are projected to increase from 1.1 million units to 1.9 million units from 1981 to 1982, as shown in Exhibit V-3. This is a 73% increase in the number of shipments.



# EXHIBIT V-3

## WORLDWIDE ANNUAL SHIPMENTS OF PERSONAL COMPUTER SYSTEMS



- Growth will be nearly as dramatic over the next five years. Personal computer shipments are projected to increase to 10.1 million units by 1987. This represents a 40% annual average growth rate from 1982 to 1987.
- Although this number of shipment of personal computers seems staggering when compared to shipments of mainframes or even of minicomputers, the shipments will still be far from saturating the marketplace in 1987.
- Tandy has been the leader in shipping personal computers since it entered the business in 1978, and it has not given up that lead to date. In fact, Tandy shipped 270,000 units in calendar year 1981.
  - Its closest rival, Apple Computer, shipped 225,000 units worldwide.
  - IBM, which was third in user expenditures, trailed Commodore in units shipped. Commodore shipped 218,000 computers in 1981, whereas IBM shipped 50,000. Many of IBM's shipments are the more expensive systems.
- In 1982 Tandy will continue to lead in worldwide shipments of personal computers with 420,000 units.
  - Commodore will come in a distant second with 335,000 units.
  - Apple will be a close third with 325,000 units.
  - IBM will ship a total of 260,000 units for fourth place in 1982.
- Tandy is projected to continue to lead all other vendors in worldwide shipments of personal computers through 1987 in which year it will ship over two million personal computers.

- IBM will be in second place in that year shipping just under 1.6 million personal computers.
- Commodore is expected to be in third place shipping 1.4 million units.
- Apple will be in fourth place shipping 1.2 million units.
- Although IBM will be the leader in user expenditures in personal computers, it will not be the leader in units shipped because the average price per system that IBM sells is expected to be higher than Tandy's average unit price.

## 2. CUMULATIVE WORLDWIDE PERSONAL COMPUTER SHIPMENTS

- As shown in Exhibit V-4, Tandy is projected to be the worldwide leader in total installations in 1987 with slightly more than eight million computers installed.
  - IBM will be a distant second with just over five and one-half million installations.
  - Commodore and Apple Computer are projected to be in relatively close third and fourth positions.
- INPUT expects that at least 100 other vendors will be marketing personal computers in 1987 and that those vendors will account for nearly 14 million installations.
  - At least one other vendor may have a dominant share of those other installations and be vying with Tandy for leadership in installations by 1987. But there are so many very good contenders already in the marketplace today and still others remaining to enter, particularly from foreign lands, that it's too early to forecast which vendor will be added to the list of leaders in 1987.

EXHIBIT V-4

WORLDWIDE CUMULATIVE SHIPMENTS  
OF PERSONAL COMPUTER SYSTEMS  
(thousands)

VENDOR	CALENDAR YEAR-END 1981	MARKET SHARE	1982	MARKET SHARE	1987	MARKET SHARE
Apple	440	20%	765	19%	4,690	12%
Tandy	600	27	1,025	25	8,215	22
Commodore	440	20	775	19	5,410	14
IBM	80	4	340	8	5,630	15
Subtotal	1,560	71%	2,905	71%	23,945	63%
Other	630	29	1,185	29	13,915	37
Total	2,190	100%	4,090	100%	37,860	100%



- The keys to leadership in shipments will be technological superiority in both hardware and software and excellent marketing and distribution talent. Excellent production capability will also be requisite.

### 3. U.S. MARKETPLACE

- U.S. installations will account for a large portion of worldwide installations by 1987. A legitimate question is whether the U.S. marketplace is large enough to sustain all those shipments. It indeed is.
- There is a staggering market potential for the sale of personal computers in the U.S. Even today INPUT feels the market could absorb 40 million installations if the potential using public fully appreciated the value of the personal computer in contributing to an increase in their productivity. In fact, INPUT sees this potential as the biggest challenge to personal computer vendors.
- In 1981 there were nearly 17 million businesses in the U.S., as shown in Exhibit V-5, the vast majority of them being proprietorships and partnerships. By 1987 the number of businesses will increase to over 20 million, of which proprietorships and partnerships will account for 17 million. Each one of these business entities is a prospect for a personal computer.
- In addition, there were over 50 million white collar workers in the U.S. in 1981. This number will grow to 58 million by 1987.
  - Of those white collar workers, certain ones are especially good prospects for a personal computer, not only in their offices but in their homes. In their offices many of them may well have more than one personal computer by 1987. In fact, a number of people have more than one today.
  - Prime prospective users of the personal computer include workers in the professional and technical category, which exceeded 16 million



# EXHIBIT V-5

## BUSINESS AND WHITE COLLAR WORKER POPULATION\* (millions)

TYPES OF BUSINESSES	1981	1982	1987
Proprietorships and Partnerships	14.5	15.0	17.4
Corporations	2.4	2.5	2.9
Total	16.9	17.5	20.3
<u>Types of White Collar Workers:</u>			
Professional and Technical	16.7	17.0	19.0
Managerial and Administrative	9.2	9.4	10.2
Clerical	18.9	19.2	21.2
Other	6.8	7.0	7.6
Total	51.6	52.6	58.0

\* Forecast by INPUT based on government data.

individuals in 1981 and will grow to over 19 million by 1987. Other prime prospects are the managerial and administrative class of workers which will grow from 9 to 10 million individuals by 1987.

- Clerical personnel will also be heavy users of personal computers. Their numbers now rank approximately 19 million and will grow to more than 21 million by 1987.
- From 1981 to 1987, INPUT expects the personal computer to go through two or three generations of development.
  - Many of the installations made in 1981 and 1982 will be obsolete by 1987.
  - Many of those installations will be supplemented or replaced by additional installations of personal computers.
- To some degree, the phenomenon seen in the calculator marketplace is expected in the personal computer marketplace.
  - Today it's not unusual for an individual to own half a dozen calculators, upgrading as a new generation comes out with new, built-in scientific functions, business functions, statistical functions, printing capability, graphics capability, or calendar capability. Some individuals even buy calculators so they can play music on them.
  - The end result is that many individuals have calculators piling up in their kitchens and office desk drawers.
- Less than 10 years ago when the electronic calculator was first introduced by Bowmar at over \$400, the potential for future installations did not seem to be very great.

- Today, many companies procure calculators for less than \$5 and give them away as promotional items. They are ubiquitous.
- A similar phenomenon is anticipated in the personal computer marketplace.
- Some professionals and technicians today are already using their third personal computer. By 1987 they may have several more. So the U.S. market potential for the personal computer seems to have very few limits at this time. And in this context the projection of 40 million installations worldwide by 1987 does not seem overly optimistic.
- It should also be noted that many personal computers are employed in scientific or process control type applications. These types of applications are not limited to the number of businesses or the number of professional people working in the U.S. but relate rather to the need to increase productivity of certain industrial or business applications.
- The problem for vendors of personal computers will not be in finding prospective buyers and end users of their equipment but rather in being able to get their attention because of the large number of competitors vying for very limited distribution channels.
- Distribution channels will expand over the next few years. Drugstores and other chain stores will be carrying personal computers as a normal line in their business.
- The mail-order business will continue to expand. Other innovative means of marketing personal computers will arise. Personal computers are already being sold by door-to-door by salesmen in some parts of the country.

- But these new distribution channels and expanded existing distribution channels will be inadequate to support all the vendors who want to reach buyers.
- Vendors who are successful will invest great financial resources in massive advertising programs and dealer support programs.
- Vendors who can develop direct distribution channels either through their own stores and outlets or through a direct salesforce will have an edge over those who must contend for shelf space.

#### 4. HARDWARE PRICE TRENDS

- The average user expenditure on a personal computer will decline slightly from \$1,950 in 1981 to \$1,800 in 1987. Since these dollar amounts are in current dollars, the real cost of a personal computer will drop substantially more due to the projected inflation rate of 6% per year. Furthermore, the user will be getting a great deal more for his dollars in 1987 than he did in 1981.
  - He will get faster processors, more RAM memory, more disk storage, and more powerful peripherals in general in 1987 than he did in 1981.
  - Voice and video processing aspects will also be included.
  - The projected lower cost will be a result of continued technological improvements in semiconductors, particularly semiconductor memories and microprocessor CPUs.
- Trends in decline of semiconductor cost over the last seven years are expected to continue over the next five years.
  - For example, in 1975 the cost of one bit of high-speed memory was \$0.01. In 1982 that same bit costs \$0.0008. This decline represents an average annual decrease of 30% per year.

- A similar, but less dramatic decline, is projected from 1982 through 1987. INPUT projects the cost of that bit to decline from \$0.0008 to \$0.0003, which is about an 18% decline per year over that period.
- The cost of the microprocessor central processing unit has shown a similar decline since 1975.
  - In 1975, the cost of a micro CPU for an 8-bit machine in single unit quantity was approximately \$100. Today, that same processor can be procured for \$2.50 and by 1987 will be available for about \$0.80.
  - The average annual decline in price of the 8-bit micro CPU was 41% from 1975 to 1982 and is projected to decline by 15% per year from 1982 through 1987.
- A corresponding decline in 16-bit microprocessor CPU prices has been observed.
  - In 1978, a single unit cost about \$100. In 1982 they can be purchased for \$10, which represents a 28% decline per year over that period.
  - By 1987 16-bit microprocessor CPUs are expected to sell for about \$3.50, a decline of 19% per year in cost.
- INPUT predicts that similar price reductions will be seen with the new 32-bit microprocessors, which will begin to be introduced broadly in 1984. It is anticipated that these units will sell for about \$100 in 1984, but will decline 33% a year through 1987 and will be available for \$30 at that time.
- Similar but less dramatic declines in peripheral equipment are projected by INPUT. Printers have declined substantially in price over the last few years as have graphics equipment such as plotters. Continued reductions in prices are projected.



- Peripheral storage devices will also decline in price in terms of pennies per byte of storage. Both floppy disk and Winchester disk drives will decline dramatically in price over the next five years.
- All these reductions in cost per function or capability will yield much more productive equipment for the end user.
  - The average price per unit for personal computers does not decline very dramatically overall in spite of these cost reductions because many computers today selling for \$1,000 to \$1,200 will be selling for less than \$500 from 1982 to 1987 and will thus drop out of the unit count of 40 million cumulative installations.
  - Another factor which will tend to keep the average unit price at the high end is that business will require much more powerful personal computers, and their average price will increase over the next few years in absolute terms while declining in relative terms of power and capability acquired.

## 5. SOFTWARE IS THE KEY TO HARDWARE SUCCESS

- After surveying how personal computers are being used today, one might come to the conclusion that Apple Computer would still be operating out of a garage rather than in massive factories in Cupertino if VisiCalc had not been introduced.
  - Until the introduction of VisiCalc, there were very limited applications available to the end user. VisiCalc changed all that.
  - VisiCalc is a systems software package that is an application development tool. It is essentially a very high-order language which lends itself to many applications. Its visual orientation has found receptive users in this television age.

- VisiCalc has been the most widely purchased software package in the business environment since software was created.
  - It continues to be successful today in spite of a myriad of look-alikes or even more powerful modeling packages that have come on the market since its introduction.
  - The key to its success has been its usability, which is a result of its flexibility.
- Usability is the key to the success of personal computer software packages.
  - Startup time is crucial, and virtually anyone can sit down with VisiCalc and have an application well on its way to development in an hour's time.
  - How quickly the software can be adapted to a particular application is also a measurement of usability. VisiCalc was easily adaptable to a variety of business applications.
- The same measure can be applied to word processing software or data base management systems software. Successful packages are those the user can become fully acquainted and operational with in only two or three hours.
- User friendliness is another concept important to the success of software for personal computers.
  - User friendliness is not measured as much in time as in convenience, and the convenience depends on the intelligence of the software. For example, the software should instruct and train the user, and the user should be able to learn how to use it from the software.
  - Users are also error prone. Therefore, user friendly software should watch for errors and offer corrective action. It should also particularly

guard the user against making disastrous errors such as destroying a file which represents a day's work.

- In hardware, user friendliness is based on keyboard layout or the kind of screen the data is viewed on.
  - Ergonomics is extremely important in creating a user friendly environment.
  - The ability to create user friendly systems is largely dependent upon very powerful processors which have access to large amounts of random access memory.
- The trends projected for the price of components on personal computers should enable vendors to create extremely user friendly systems with very usable software.
- The enormous installed base of personal computers will allow software vendors to package and price software, which is very expensive to develop, in low-cost units.
- The increase in computational power, both in terms of hardware and software, will lead to new applications, many of which are not even envisioned today.
- Many of these new applications will spring from the increased portability of the computers. They will decline not only in price but in size.
  - By 1987 extremely powerful computers in briefcase size will handle most of the chores that fairly large desktop computers handle today.
  - Portability will be a very important factor in an end user's decision to buy a personal computer.

- Another important capability is communications. End users will demand a communications capability on their personal computers.
  - In business communications will be required to talk to other personal computers. Local networks and mainframes will be needed to access corporate data bases as well as external data bases.
  - In the home communications will be required to access information sources such as newspapers, stock market quotation services, and simply for communicating messages from one individual to another. Communications will also be necessary to interface with banks for checking account reconciliation and with suppliers such as public utilities and water companies in order to pay bills.
- After IBM established itself as the leader in the computer marketplace in the 1950s, a kind of cliché grew up among its salesmen when dealing with clients or prospective clients. When the prospect asked the salesperson, "What can the computer do?" the salesperson responded, "What would you like it to do?" That same concept applies even more today in the realm of personal computers. The potential applications of personal computers seem almost limitless and yet the limits are expanding.

## C. PERSONAL COMPUTER SOFTWARE EXPENDITURES

### I. INTERNATIONAL MARKETS

- Worldwide expenditures for personal computer software will expand tremendously in the next five years, as shown in Exhibit V-6.
  - Expenditures increased 139% from 1980 to 1981 and grew another 120% to just under \$1 billion in 1982.



# EXHIBIT V-6

## WORLDWIDE USER EXPENDITURES FOR PERSONAL COMPUTER SOFTWARE\*

USER EXPENDITURES BY CALENDAR YEAR												
GEOGRAPHIC REGION	(\$ MILLIONS)		PERCENT CHANGE 1980-1981	(\$ MILLIONS) 1982	PERCENT CHANGE 1981-1982	(\$ MILLIONS)						AAGR 1982- 1987
	1980	1981				1983	1984	1985	1986	1987		
	United States	\$100	\$250	150%	\$625	150%	\$1,605	\$1,605	\$2,210	\$2,930	\$3,700	43%
Foreign	80	180	125	320	78	720	1,165	1,780	2,345	3,020	57	
Worldwide	180	430	139	945	120	1,785	2,770	3,990	5,275	6,720	48	

\* Excludes entertainment software.



- INPUT's forecast is a growth of 48% per year through 1987. The total worldwide market will reach \$6.7 billion excluding entertainment software such as games.
- In the U.S. user expenditures will grow at a faster rate in 1982 than they will worldwide.
  - In the long term foreign expenditures will increase at a significantly higher rate than U.S. user expenditures.
  - Much of the foreign expenditures will be for software developed in the U.S.

## 2. U.S. PERSONAL COMPUTER SOFTWARE MARKET

- Exhibit V-7 shows the growth of user expenditures on personal computer software in the U.S. compared to total user expenditures on all software products. Expenditures on personal computer software were only 6% of all software expenditures in the U.S. in 1981, but because of the higher growth rate of expenditures on personal computer software, those expenditures will equal 13% of the total software expenditures in 1987.

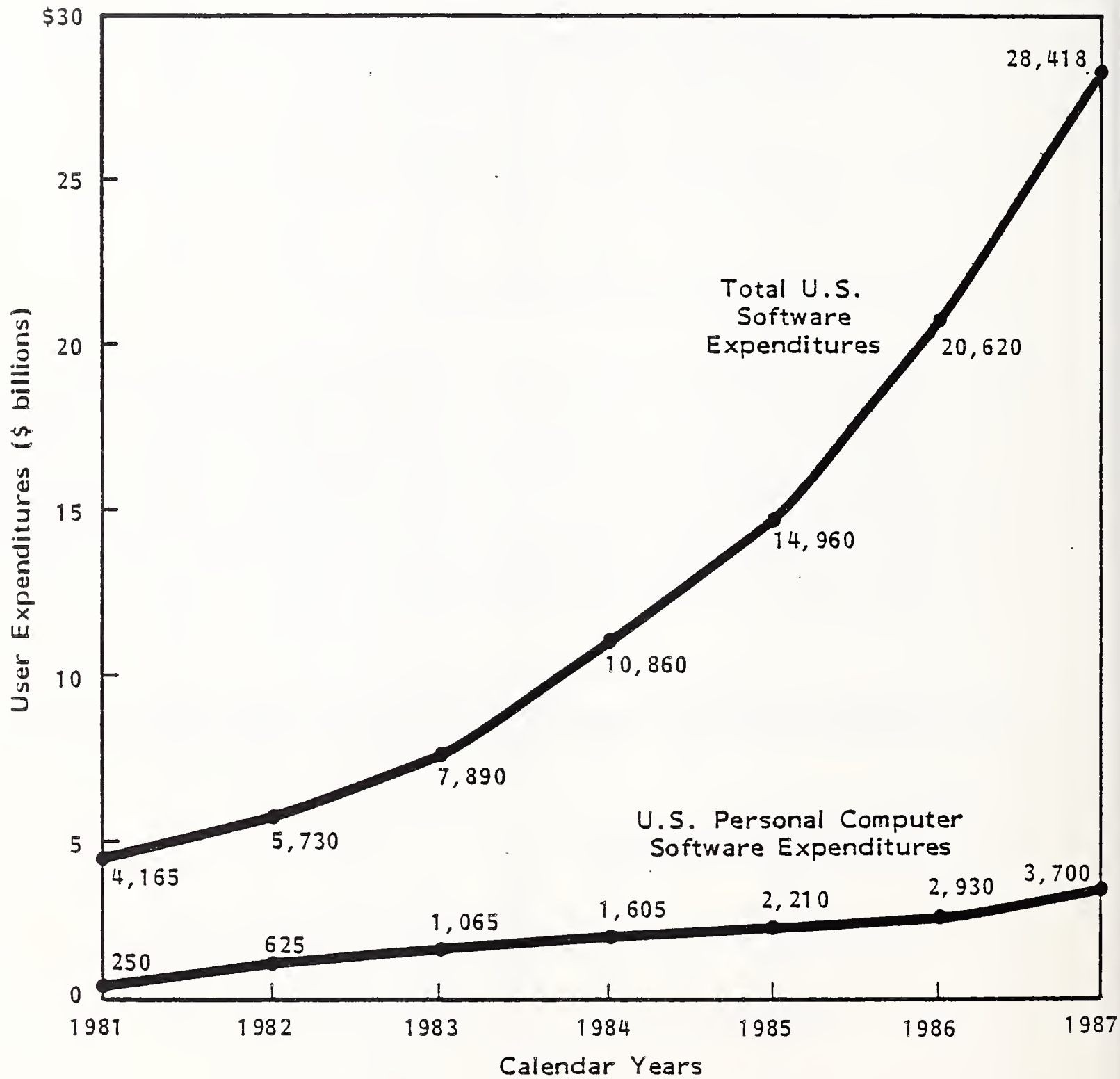
## D. SYSTEMS SOFTWARE MARKET FOR PERSONAL COMPUTERS IN THE U.S.

### 1. MARKET SEGMENTATION

- INPUT divides the systems software market into three segments:
  - Systems control.
  - Data center management.
  - Applications development.

EXHIBIT V-7

RELATIVE SHARE OF PERSONAL COMPUTER SOFTWARE  
TO TOTAL SOFTWARE PRODUCTS  
UNITED STATES USER EXPENDITURES



- Systems control software products include operating systems, communication monitors, point-to-point control software, access control software, encryption systems, and systems library control.
- Data center management software products includes performance monitors, capacity management, data center management, storage management, computer operations scheduling, downtime repair monitoring, job accounting, and utilities packages.
- Applications development software products include two broad categories.
  - The first category is program development and production tools. Included in this category are languages, assemblers, compilers, translators, project control management systems, automatic documentation, debugging aids, retrieval systems, and application generators.
  - The second major subcategory is data base management systems software and includes all software of that type.
- Exhibit V-8 shows the U.S. user expenditures for personal computer systems software.

## 2. SYSTEMS CONTROL SOFTWARE

- In the personal computer marketplace, systems control software consists primarily of operating systems and communication monitors.
- In all cases, user expenditures are for unbundled software and do not include expenditures for operating systems that are included with hardware when purchased as a unit.
- Systems software is projected to grow 187% to \$115 million in 1982. From 1982 to 1987 it is projected to grow at an average annual growth rate of 36% and reach \$530 million in 1987.

EXHIBIT V-8

U.S. USER EXPENDITURES FOR PERSONAL COMPUTER SYSTEMS SOFTWARE  
(\$ millions)

SYSTEMS SOFTWARE	1981	1982	PERCENT CHANGE 1981-1982	1983	1984	1985	1986	1987	AAGR 1982-1987
System Control	\$40	\$115	187%	\$220	\$290	\$360	\$435	\$530	36%
Data Center Management	5	15	200	30	45	60	80	100	46
Applications Development	80	180	125	295	440	580	745	900	38
Total	\$125	\$310	148%	\$545	\$775	\$1,000	\$1,260	\$1,530	38%

- As local area networks proliferate, communications monitors and systems library control software will become an increasingly important part of this marketplace.

### 3. DATA CENTER MANAGEMENT SOFTWARE PRODUCTS

- Data center management software, at only \$5 million in 1981, is practically nonexistent. What little software was sold in this category was involved with storage management, job accounting, and utilities.
- Data center management software, though, is projected to grow at the highest rate of the three systems software categories growing at 46% through 1987 to reach \$100 million in that year.
- INPUT predicts that this market will grow rapidly due to the need for software to manage the activities of personal computers in large local networks within large corporations. Large corporations with thousands of installations will also need downtime and repair monitoring management software products.

### 4. APPLICATIONS DEVELOPMENT SYSTEM SOFTWARE PRODUCTS

- The applications development software category is the largest of the systems software categories with just under 60% of the total market in 1982.
- INPUT projects that application development software will grow at an average annual growth rate of 38% and reach \$900 million in 1987 which will represent 59% of the systems software marketplace for personal computers.
- Languages are among the most sought after software packages in this category. Two of the most widely used are Pascal and BASIC. Logo is becoming an increasingly important language, particularly in the education environment.



- User expenditures in languages are expected by INPUT to shift increasingly to APL with the advent of 16- and 32-bit machines.
  - With the availability of high-speed 16-bit processors and megabyte memories, APL will prove a strong attraction for end users, particularly those involved in financial analysis and forecasting.
  - Growth of the language will also be stimulated by the fact that it is a preferred language on IBM's Information Network Service.
- IBM's Information Network Service can be accessed with IBM's Personal Computer with appropriate communications hardware and software.
- A large number of application generators have been brought to the market in 1982 and are receiving high user acceptance.
  - These systems will become increasingly sophisticated in the next few years and will fulfill many user needs.
  - Growth in user expenditures for application generators will outstrip the growth in languages.
- Data base management systems (DBMS) software expenditures are expected by INPUT to grow at a higher rate than other systems software. These packages are designed to meet a variety of different levels of use.
- Software Publishing Company of Mountain View, California offers PFS, also known as Personal Filing System, which is oriented toward the entry level user.
  - This package is extremely easy to use but is rather limited in its capability.

- Software Publishing Company has brought out a follow-on package called PFS Report which increases the capability of the system substantially but which, overall, is still of limited capability.
- At the other extreme, DB Master and Versaform are very sophisticated systems for the personal computer environment.
  - They take a great deal longer to learn than systems like PFS, but in turn they provide a lot more power to the end user in the control, manipulation, and display of data.
  - Both packages operate on Apple computers in native mode.
- Ashton-Tate offers a powerful DBMS called dBASE II for use on CPM systems.
  - Although this system is based on ISAM files, the user can work with it conceptually as if it were a relational DBMS.
  - The product will operate on Apples with CPM.
  - It is available in a hard disk as well as a floppy disk version.
- The DBMS market for personal computers is hotly contested by several dozen vendors.
  - Major enhancements and/or new modules appear to be annual events at most vendors.
  - Revenues from add-on products are becoming significant.

## E. APPLICATIONS SOFTWARE MARKETS

### I. MARKET SEGMENTATION

- For purposes of analysis and forecasting, INPUT divides the applications software marketplace into eight segments:
  - Accounting.
  - Human resources.
  - Information analysis.
  - Sales/marketing distribution.
  - Word processing.
  - Graphics.
  - Other.
  - Industry specific.
- User expenditures on applications software for the personal computer are projected to grow from \$120 million in 1981 to \$315 million in 1982, a 160% increase, as shown in Exhibit V-9.
  - This growth rate is higher than the 148% projected for systems software.
  - INPUT projects that user expenditures on applications software will continue to increase at a higher rate than systems software over the next five years.

# EXHIBIT V-9

## U.S. USER EXPENDITURES FOR PERSONAL COMPUTER APPLICATIONS SOFTWARE

(\$ millions)

APPLICATIONS SOFTWARE	1981	1982	PERCENT CHANGE 1981-1982	1983	1984	1985	1986	1987	AAGR 1982-1987
Accounting	\$25	\$65	160%	\$110	\$170	\$245	\$330	\$400	44%
Human Resources	6	15	150	25	36	50	67	85	41
Information Analysis	42	105	150	185	320	490	700	930	55
Sales/Marketing	2	5	150	7	9	12	15	20	32
Word Processing	30	85	183	130	180	240	300	380	35
Graphics	5	15	220	24	40	60	85	120	50
Industry Specific	8	19	138	30	60	92	146	200	60
*Other	2	6	200	9	15	21	27	35	42
Total	\$120	\$315	160%	\$520	\$830	\$1,210	\$1,670	\$2,170	47%

\*Does not include game or entertainment software.

- Applications software will sustain this high rate of growth because users are looking for turnkey type systems.
  - That is, they wish to purchase a small computer, buy some software for it, and solve their problem almost immediately.
  - There are many packages on the marketplace today which can fulfill these needs in certain application areas. Many more are being added to the list every day.
  - Some software publishing houses have been receiving as many as 100 unsolicited software packages every month.

## 2. ACCOUNTING SOFTWARE

- Accounting software packages include general ledger, accounts payable, accounts receivable, purchasing and procurement packages, and fixed asset accounting.
- User expenditures in 1981 on accounting software were the third highest of the eight categories at \$25 million. INPUT projects user expenditures on accounting software will increase at a 44% average annual growth rate and reach \$400 million by 1987.
- Much of the accounting software to date has been bought by professionals in the accounting field, such as bookkeepers and CPAs, who use it primarily for write-up work for their clients.
  - In the future INPUT expects that small businesses will increasingly do their own accounting as the packages become easier to use and more foolproof.
  - There are at least 50 well-publicized accounting packages on the market today for personal computers.



- One of the most widely used packages or set of packages is sold by Peachtree Software, a company which was acquired by Management Science America recently.

### 3. HUMAN RESOURCES SOFTWARE

- Software in this category includes payroll packages, personnel packages, benefits packages, and training and education packages.
  - In the human resources category only payroll and training packages have made a significant impact at this time.
  - Both of these applications are expected to continue to contribute a great deal to the growth of human resources applications.
  - Projected to be only a \$15 million market in 1982, user expenditures will grow to \$85 million by 1987, which represents a 41% average annual growth rate.

### 4. INFORMATION ANALYSIS

- Information analysis is the largest and one of the fastest growing applications software areas for personal computers.
  - Information analysis software includes forecasting, modeling, budgeting, financial planning, and decision support systems.
  - Software in this category ranges in cost from as little as \$50 for Comshare's Target to \$1,500 for Micro DSS.
  - Many of the more sophisticated packages offered in information analysis can compete effectively with timesharing applications.

- User expenditures on information analysis packages is projected by INPUT to grow from \$105 million in 1982 to \$930 million in 1987 with a growth rate of 55% per year.
  - Much of this growth will be at the expense of remote computing service companies.
  - The threat to the remote computing service companies will become increasingly greater as personal computers become faster with the 16- and 32-bit machines and with much larger memory capability, and as high-speed disk access with Winchester drives in the 5 to 10 megabyte storage capability becomes available.

## 5. SALES, MARKETING, AND DISTRIBUTION

- This category of applications software includes order entry, invoicing/billing, sales analysis, distribution accounting, inventory accounting, and mailing list management.
  - Mailing list applications and invoicing/billing applications are the largest applications in this group.
  - User expenditures of only \$5 million are projected for 1982, and they will grow at a moderate rate of 32% per year to reach \$20 million by 1987.

## 6. WORD PROCESSING

- User expenditures on word processing are projected to be second only to the information analysis category in 1982. Growth of word processing user expenditures from 1981 to 1982 is projected to be 183%. Growth in word processing expenditures will moderate quite a bit over the next few years and result in only a 35% annual growth rate from 1982 to 1987 but will still result in a \$380 million marketplace by 1987.

- Growth in user expenditures is expected to moderate because this is an extremely competitive marketplace with dozens of packages for many types of machines, and there will be intense price competition.
- The price range for word processing software ranges from as little as \$25 to close to \$1,000 for a combination of packages.
- A typical end user spends between \$250 and \$300 on a word processing system. INPUT projects that these prices will drop down to the \$75 to \$125 range within the next two years. Therefore, although user expenditures will not grow at a great rate, installations will.

## 7. GRAPHICS

- Graphics in plotting applications software is projected to grow the fastest between 1981 and 1982 at 220%.
- INPUT projects that long-term growth will also be high with a 50% average annual growth rate from 1982 to 1987.
- Revenues will increase from \$15 million in 1982 to \$120 million in 1987.
- INPUT expects that very few Fortune 1000 businesses will be without some sort of graphics plotting package. Most of these graphics packages will rely on simple dot-matrix printers when printing is required, but in areas like marketing and planning where graphics are a very important part of communication with senior management, line plotters will rule the day.

## 8. OTHER

- This category includes miscellaneous software used in corporate services, administrative services, project control and planning, operations research, scientific and technical support, and entertainment.

- The revenues estimated in the forecasts presented in this report do not include entertainment software for the personal computer. Although games are an important market in the home, they do not have much of a place in the business marketplace.
- The other category is projected to generate \$6 million in user expenditures in 1982.
  - It will grow 42% per year and reach \$35 million by 1987.
  - Operations research software and scientific and technical support applications are the major contributors to this category.

## 9. INDUSTRY SPECIFIC SOFTWARE

- Industry specific software includes software that is sold only within a specific industry sector. INPUT divides these industry-specific sectors into 14 groups:
  - Discrete manufacturing.
  - Process manufacturing.
  - Transportation.
  - Utilities.
  - Banking and finance.
  - Insurance.
  - Medical.
  - Education.

- Retail.
  - Wholesale.
  - Federal government.
  - State and local government.
  - Services.
  - Other industries.
- Since total user expenditures are projected at only \$19 million in 1982, INPUT has not attempted to break these revenues down into specific industry categories. However, the most important industry sectors in terms of user expenditures for specialized software from 1982 to 1987 will be:
    - Services industries, such as medicine and business services.
    - Banking and finance.
    - Insurance.
    - Distribution, retail, and wholesale.
    - Manufacturing.
  - Industry-specific software is projected to grow at 60% per year, reaching \$200 million by 1987. Thus it is the fastest growing sector. Although this is a very high growth rate, it is tempered by the fact that some personal computers will be sold as integrated systems or turnkey systems and thus will not be counted in this category of applications software.



## F. IMPACT OF PERSONAL COMPUTERS ON COMPUTER SERVICE VENDORS

### I. SOFTWARE VENDORS

- The introduction of personal computers has had and will continue to have a positive impact on the software industry. User expenditures on personal computer packaged software are largely coming from a previously untapped market, but in the future they will make inroads into traditional packaged software markets for minicomputers and mainframes.
- Since personal computer packaged software will represent 13% of the total software market by 1987 and also since it is the fastest growing sector of packaged software, INPUT recommends that all software vendors closely evaluate their current position and commence involvement in the personal computer marketplace.
- One approach to enter the market is by acquisition. MSA has taken this approach through its acquisition of Peachtree Software, and Comshare has also entered the personal computer marketplace through an acquisition of a small company. INPUT believes that the acquisition route is the best one to take for companies unfamiliar with this market.
- The distribution channels are entirely different for personal computer software than for mainframe or even minicomputer software. If the acquisition is at a fair price, the safest route is to obtain the knowledge of distribution channels as well as the software by acquisition.
- Another route software vendors may take is to acquire personal computer software through licensing and distribution agreements. This costs less than the acquisition route and does get the software products to market, but the vendor still needs to develop experience in exploiting available distribution channels. Some of this experience may be acquired through hiring.

- Another avenue software vendors can take is to develop packaged software directed toward personal computers.
  - In doing this, many vendors may exploit their experience on larger systems with applications they are most familiar with.
  - This is probably the most risky route of all to take. Although it may be the least expensive initially, it could end up costing substantially more than the other routes if mistakes are made along the way.
- The last approach may be for software vendors simply to wait for the market to reach them.
  - If a software vendor is currently enjoying very high growth in existing markets, it may be worthwhile to wait a few years before entering the personal computer marketplace.
  - Microprocessors and their operating systems are expected to grow up into the mainframe arena in the next several years through either 68000-based systems utilizing UNIX or through 32-bit mainframes utilizing a 370 instruction set.
  - In both cases, some vendors may find it prudent to simply start orienting their development toward accommodating their software on these systems.
- Whichever route a vendor takes, the distribution channels problem may diminish in the near future. Many of the large personal computer manufacturers like IBM and Apple have established distribution programs for third-party vendors where they will assume the marketing responsibility for software developed by other parties.

- In summary, INPUT recommends that all software vendors get involved in personal computers to some extent, if for no other reason than to identify future opportunities with greater expertise.

## 2. PROCESSING SERVICES

- Current processing services will receive a significant negative impact from the personal computer in the next five years.
  - Both batch and remote computing service vendors are already losing small portions of their business to the personal computer.
  - This trend will accelerate over the next few years as larger, more powerful, and more capable systems are available at ever lower prices.
- INPUT sees the greatest threat to remote computing services in the application area of information analysis and in application development, specifically in data base management systems.
  - Many prospective and current users of remote computing services for information analysis will see the personal computer as not only a more economical route to take but also one in which they exercise far more control.
  - Many forecasting and modeling applications today can be served very well by personal computers. In the future, decision support systems will also be well supported by them.
- Small applications requiring a data base management system are already vulnerable to the personal computer, but as local area networks expand in the future and as better access control and systems library control become available on these systems, data base management systems requiring 5, 10, or even 20 megabytes of storage will become increasingly attractive in the personal computer environment.

- INPUT anticipates also that conversion services will arise to assist users in converting their remote computing data bases onto personal computer systems.
- Batch processing services are also vulnerable in a number of application areas.
  - Users of payroll services with less than 50 employees are likely to find payroll packages on personal computers attractive today.
  - Tax form preparation services also have potential for personal computers as there are a number of good tax preparation packages available.
  - Tax planning is becoming an important area on personal computers also.
- Batch processing services providing general ledger and other accounting application services also are threatened by the personal computer.
- For both batch processing and remote computing service companies, the personal computer also provides a strong threat in the industry-specific application areas. Personal computers are already penetrating the banking and finance and discrete manufacturing sectors - two of the largest sectors served by processing services.
- Many graphics applications both in batch processing and RCS are also vulnerable to the personal computer.
- Processing services will see their businesses affected in much the same way as they were by minicomputers and turnkey systems in the past, but the personal computer will have a more widespread and deeper impact on their growth.
- Many processing service vendors are taking an approach which INPUT recommends, which is to get involved with personal computers themselves. They may package products and applications with which they are most familiar



for the personal computer. Processing service vendors who aggressively get involved in distributing personal computers will find many excellent opportunities for growth.

- A very large part of the personal computer marketplace will be in Fortune 500/50 type companies, and the buyers will be the traditional end users of remote computing services.
  - Another segment will be in small businesses where batch services companies have much direct marketing expertise.
  - Service companies are well-acquainted with these areas and are most capable of exploiting the markets.
- Processing services companies can connect personal computers into networks to provide data bases, software support, news, and interconnection services (such as electronic mail). Services companies can provide important software and data base maintenance activities as well as backup, consulting, and professional services related to personal computers.
  - Network support and access to data bases are much needed by personal computer users. The spread of personal computers provides literally millions of potential access points to remote computing services.
  - In summary, INPUT feels the processing service companies have more to gain than to lose in offering personal computer products. However, they will have to change their services delivery mechanisms and marketing in order to fully benefit.

### 3. PROFESSIONAL SERVICES

- INPUT believes that there are excellent opportunities for professional services companies offering services involving the personal computer.



- INPUT estimates that the current market for professional services involving personal computers will be about \$25 million in 1982 and projects that professional services will grow to about \$250 million by 1987.
- This growth will come in response to professional services companies meeting personal computer users' needs.
- The current need being met by professional services companies is writing custom software for user applications. There will be a continued demand for this type of service, but a number of new opportunities will present themselves.
- Personal computer users will have requirements for conversion of applications from both in-house and computer service systems. Many of these conversions will require local area networks with substantial Winchester disk storage available.
- Personal computer buyers will also need professional assistance in procurement and selection of equipment.
- A strong market will also develop for educational and training services in the use of the personal computer.
- The greatest challenge to professional services firms will be to provide these services on a cost-effective and profitable basis. This will probably require different distribution approaches, such as consulting and development shops.

#### 4. INTEGRATED SYSTEMS

- Systems integrators will find personal computers a low-cost alternative to the minicomputer for many applications.

- The greatest opportunities for systems integrators will be industry-specific applications.
- In general, the personal computer is increasing the computer intelligence of the average end user. This will result in a greater appreciation of the value of integrated systems and the cost of those systems.

## 5. PERSONAL COMPUTER SYSTEMS VENDORS

- Obviously, there are great opportunities for personal computer systems vendors in this rapidly expanding marketplace, but it will not be easy for individual vendors to exploit them.
  - INPUT believes that a squeeze is already taking place for personal computer systems in distribution channels, particularly the retail distribution channels.
  - A substantial shakeout is likely to take place in 1983 in which many vendors will find few outlets for their systems, find narrow niches, or withdraw from the market.
- Systems vendors will either have to develop a significant market share early on or concentrate on specific niches of expertise. The general purpose personal computer marketplace already has many more vendors than it can sustain.
- Many retailers are already carrying more lines of equipment than they can sell. INPUT advises personal computer systems manufacturers to try to establish their own proprietary distribution networks. Personal computer vendors should also look to more actively sell directly to the Fortune 1000/50 companies.

- In order to do this they will have to develop support organizations for end users both in software applications and in field services for hardware.
- IBM, Digital Equipment Corporation, and Hewlett-Packard will present the greatest challenge to other vendors in that marketplace.



## APPENDIX A: HARDWARE VENDOR PROFILES





## APPENDIX A:      HARDWARE VENDOR PROFILES

### A.   APPLE COMPUTER, INC.

10260 Bandley Drive  
Cupertino, CA 95014  
(408) 996-1010

#### 1.   BACKGROUND

- Apple Computer, Inc. was founded in 1976. In 1977 the company introduced its Apple II system, which was sold primarily through independent distributors, franchises, and a small number of company-owned stores.
- In November 1981, Apple opened a 40,000 square foot assembly plant in Cork, Ireland.
- Apple acquired Microsense Computer, Ltd. as its authorized distributor in the United Kingdom in February 1981.

#### 2.   GROWTH

	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
Total Revenue (\$ millions)	\$ .8	\$8.0	\$48	\$117	\$335
Annual Growth Rate over the Previous Year		900%	500%	145%	185%

- Apple increased its manufacturing facilities from 280,000 square feet in 1980 to 670,000 square feet in 1981. This was an increase of 139%.

### 3. CURRENT PRODUCTS

- Introduced in 1977, the Apple II replaced the initial system, which had been designed primarily for the hobbyist market. The maximum selling price remained below the \$2,000 level until the 1979 announcement of the Apple II PLUS with an extended BASIC in ROM. The enhancement alone did not increase the price, but it allowed optional packages, such as Applesoft II, a firmware card with Auto-Start in ROM to be added, thus making turnkey software resident in ROM available to the user once the Apple II was turned on.

- Apple II's operating system is the Apple DOS 3.3.

- Apple II's microprocessor is the 6502.

- The Apple III was reintroduced in 1981. Designed principally for business applications, the Apple III is a compatible, upward expansion of the Apple line designed for managers, financial analysts, administrators, and professionals. Internal memory is expandable to 256K-bytes.

- Apple III's operating system is SOS.

- Apple III's microprocessor is the 6502.

- Apple III's price will range from \$3,495 to \$6,990 suggested list, depending on the configuration.

### 4. DISTRIBUTION CHANNELS

- Apple has a worldwide dealer network totaling 3,000 authorized dealers. Apple's dealer service and support infrastructure in the U.S. and Canada

exceeds 1,000 locations which are backed up by Apple's own distribution and service centers at six U.S. and three international sites.

## 5. FUTURE DIRECTION

- Apple will introduce LISA (or Super II) in January 1983, a less expensive and more powerful system than the Apple II.
- It is anticipated that Apple will introduce a 16-bit machine during the summer of 1983. The new computer is expected to be very sophisticated and will compete directly with IBM, Radio Shack, and DEC entries.
- Apple's probable future direction has a heavy emphasis on office functions for business applications. INPUT does not expect it to move into competition with home/entertainment computers such as Atari.

## B. TANDY (RADIO SHACK)

1800 One Tandy Center  
Fort Worth, TX 76102  
(817) 390-3700

### I. BACKGROUND

- The Tandy Corporation acquired Radio Shack in 1963 as part of an integrated strategy aimed at a profit center concept of operations little used in retail merchandising. Through Radio Shack, the company introduced its TRS-80 in August 1977. The merchandising expertise of the Tandy Corporation coupled with the talents of Radio Shack dealers provided the main stimulus for the skyrocketing success of the new product; it was initially designed for personal and hobbyist use, but the general business public was quick to realize the potential benefit of small, standalone systems.

## 2. GROWTH

	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1977-1981</u> AAGR
Total Revenue (\$ millions)	\$949	\$1,059	\$1,216	\$1,385	\$1,691	
Annual Growth Rate over the Previous Year		12%	15%	14%	22%	16%

- The Radio Shack division represents nearly 100% of Tandy's overall net sales.
- Of the net sales figures, microcomputers, software, and peripheral equipment represent the following proportions:

<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
0	2%	10%	15%	22%

## 3. CURRENT PRODUCTS

- The TRS-80 is available in four models. The Model I is the low end of the product. The Model II is Radio Shack's popular business and educational machine. The Model III is a general purpose computer, and Model 16 is the newest Radio Shack computer.
- The TRS-Model 16 was the industry's first personal computer with a 16-bit chip. Radio Shack's is impressive in that it offers the Motorola 68000 CPU, one of the current state-of-the-art microprocessors. The Model 16 is significant because it can operate programs written for Tandy's previous generation of TRS-80 Model II computers, as well as more powerful programs Tandy plans to provide for the Model 16 later this year. The Model 16 also incorporates the Z-80 8-bit microprocessor allowing the Model 16 to use the vast catalog of 8-bit software written for it.



- The Model 16, with a built-in 8-inch disk storage device and 128,000 characters of main memory, is \$4,999. Memory can be expanded to 512,000 characters. Hard-disk can also be included which can store 8.4 million characters.

#### 4. DISTRIBUTION CHANNELS

- Tandy currently distributes retail electronics to the world market through 5,147 company-owned retail stores plus more than 3,000 dealer/franchise outlets. In number of outlets, Radio Shack is the largest retail electronics chain in the world.

#### 5. FUTURE DIRECTION

- Tandy will be offering a kit which will enable owners to upgrade their existing Model II computers into a Model 16, an option not commonly offered outside the mini and mainframe world. This kit is expected to cost \$1,499.
- Tandy aims to compete head to head with Apple and IBM in the professional business market, the home, and education.

### C. COMMODORE INTERNATIONAL LIMITED

Valley Forge Corporate Center  
950 Rittenhouse Road  
Norristown, PA 19403  
(215) 666-7950

#### 1. BACKGROUND

- Commodore was founded in 1958 as Commodore Business Machines (Canada) Ltd. by its current vice chairman and chief executive officer, Jack Tramiel. In 1970, still primarily a marketing organization, it entered the calculator business. In 1975 Commodore suffered industrywide problems and lost \$5

million on sales of \$56 million. At that point Commodore altered its philosophy to one of integration. It survived to buy and turn around several troubled semiconductor houses and eventually entered the personal computer business with the first computer system under \$1,000.

## 2. GROWTH

	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1978-1981 AAGR (percent)</u>
Total Revenue (\$ millions)	\$ 50	\$ 71	\$ 126	\$ 187	
Annual Growth Rate over the Previous Year	9%	42%	77%	49%	55%

## 3. CURRENT PRODUCTS

- The VIC-20 is a full-featured, expandable, color computer priced at under \$1,000. The VIC 20 features color, sound, programmable function keys, 5K-bytes of memory expandable to 32K and built-in BASIC. VIC utilizes the 6502 microprocessor.
- The Pet 4000 series is basically an educational and scientific computer, combining keyboard, display, and processor in one unit. The 4000 offers 34K or 50K combined RAM/ROM memory, utilizing the 6502 processor. The standard language for the 4000 series is BASIC.
- The CBM 8000 series is aimed primarily at business and professional markets, to be used as a management tool. Available ROM memory is 18K, RAM memory is 32K or 96K. The microprocessor is the 6502, utilizing DOS 2.5 as the operating system and BASIC as its programming language.
- The SuperPET 9000 series is a 16-bit computer that was introduced to the personal computer market during the spring of 1982. The SuperPET is based on the CBM 8032 system incorporating the use of the 6502, 8-bit and the 6809,

16-bit microprocessor. This enables the SuperPET to use all the software designed for the 8032 machine as well as the advanced 16-bit software designed for the 9000 series. ROM memory available is 36K, RAM is 96K. The standard languages used with the SuperPET are: CBM BASIC 4.0, Waterloo microBASIC, microPASCAL, microFORTRAN, microAPL, and Assembler (6809).

#### 4. DISTRIBUTION CHANNELS

- In the United States, Commodore distributes through company-owned stores, Macy's, Emporium Capwell's, specialized national store chains (e.g., "Photo and Sound" handling VIC-20), and a number of independent and franchised retail computer stores.
- In Europe where Commodore's name is best known, an elaborate distribution chain has been established using office equipment dealers as primary dealers. One hundred million dollars of the \$132 million in computer sales comes from the European market.

#### 5. FUTURE DIRECTION

- Commodore recently entered into a five-year agreement with TRW to service and maintain Commodore microcomputers throughout the United States.
- Commodore will shortly introduce a CP/M add-on board with a Z-80 CPU, to enable its users to draw on the vast program library of applications now running under CP/M.
- Commodore recently demonstrated its office-of-the-future concepts at an international computer show in the United Kingdom. With an emphasis on communications, Commodore demonstrated networking systems and Commodore computers connected to most mainframe computers, including IBM and Digital Equipment.

#### D. IBM CORPORATION

Systems Products Division  
P.O. Box 1328  
Boca Raton, FL 33432  
(305) 998-6076

##### 1. BACKGROUND

- IBM is the largest provider of computer services and hardware in the world, with a 1981 gross income (from sales, rentals, and services) of \$29,070,000,000.
- In the fall of 1981, IBM announced its official entry into the personal computer market with the IBM Personal Computer. The IBM Personal Computer will compete primarily for the business and professional markets against DEC, Apple, and Radio Shack.

##### 2. GROWTH

	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1977-1981</u> AAGR (percent)
Total Revenue (\$ millions)	\$18,133	\$21,076	\$22,862	\$26,213	\$29,070	
Annual Growth Rate (percent)	11%	16%	8%	15%	11%	13%
Number of IBM Employees	310,155	325,517	337,119	341,279	354,936	

##### 3. CURRENT PRODUCTS

- The current products section will be restricted to IBM's Personal Computer. This is because of the vast number of products IBM offers. The IBM Personal Computer features the CP/M-86 operating system, utilizing the Intel 8088

microprocessor. Optional to the Personal Computer are a display, a printer, and floppy disk drives. The price ranges from \$1,565 to \$4,500. RAM memory begins at 16K and expands to 256K. The high-level languages offered with the Personal Computer are BASIC and PASCAL.

- IBM has been selling personal computers since the mid-1970s in various forms.
  - Certain minimal configurations of the 5100 series qualify for INPUT's definition of personal computers.
  - The Displaywriter and the Data Master are also essentially low-cost personal systems.

#### 4. DISTRIBUTION CHANNELS

- In an uncommon move, IBM will venture outside its company-owned distribution channels to sell the Personal Computer by Computerland and Sears Roebuck in addition to their own product centers and national account salesmen.

#### 5. FUTURE DIRECTION

- IBM will be very successful in the Fortune 1000 market, depending heavily on its national accounts as a point of entry with the personal computer.
- In order for the IBM Personal Computer to be truly useful, software must be developed quickly. IBM has been encouraging outside vendors in an effort to generate good 16-bit software.



## E. XEROX CORPORATION

Stamford, CT 06904

(203) 329-8700

### 1. BACKGROUND

- Xerox Corporation is the largest manufacturer of reprographics in the world today; the name Xerox is literally synonymous with reproducing systems.
- In 1979 Xerox's Japanese affiliate, Fuji Xerox, was awarded the Dr. Deming Prize for excellence in quality and productivity of low-end copiers.
- In December 1979 Xerox introduced Ethernet network, an intraoffice communication system designed to link free-standing electronic information processing machines.
- On June 9, 1981 Xerox announced the Xerox 820 personal computer which doubles as a low-volume word processor. This announcement by W. Dal Berry, vice president and general manager of Xerox's Office Products Division, was a formal statement of Xerox's intentions to shape and market the office-of-the-future concept.

### 2. GROWTH

	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1977-1981</u> AAGR (percent)
Total Xerox Revenue (\$ millions)	\$ 5,190	\$ 6,018	\$ 6,996	\$ 8,197	\$ 8,691	
Annual Growth Rate (percent)	14%	16%	16%	17%	6%	14%
Number of Xerox Employees (thousands)	107	108	116	120	121	

### 3. CURRENT PRODUCTS (PERSONAL COMPUTERS)

- The Xerox 820, introduced in 1981, is a multifunction machine combining word processing and personal computer capabilities. The 820 is designed for the following applications and much more:
  - Word processing.
  - General ledger.
  - Job costing and scheduling.
  - Financial analysis.
  - Generating business scenarios.
  - Inventory control.
  - Engineering.
  - Real estate.
  - Management forecasting.
  - Medical billing and accounting.
  - The 820 uses the Z80 microprocessor with 64K RAM memory and 4K/ROM, dual 5¼" single-sided floppy disk drives, CP/M operating system, BASIC 80, C BASIC, and COBOL 80. Xerox also provides communications software for Teletype emulation and IBM 3270 emulation.
  - The Xerox 820 can be described as an all-around small business machine or as an advanced home computer. In the office environment, the 820

is intended as an integral part of a fully integrated office linked by Ethernet network.

#### 4. DISTRIBUTION CHANNELS

- The Xerox is sold primarily through Computerland retail computer stores and Xerox stores.

#### 5. FUTURE DIRECTION

- Because of the 820's ability to act as an intelligent terminal communicating with large IBM mainframes, Xerox will be aiming its marketing attack at the top 1,000 industrial companies in the U.S. where the office of the future will be shaped.

#### F. CROMEMCO, INC.

280 Bernardo Avenue  
Mountain View, CA 94043  
(415) 964-7400

#### I. BACKGROUND

- Cromemco is unique to the small computer industry in that it began in 1976 without any outside investment. It has achieved remarkable success since that time continuing on its own financial merits. Cromemco remains a wholly owned company by its two cofounders, Harry T. Garland and Roger D. Melen, both 34 and recipients of doctorates from Stanford.
- Cromemco began at the high end of the microcomputer field, emphasizing quality and reliability over price. A full top-of-the-line base unit sells for about \$8,000, and a complex six-user system for over \$18,000.

## 2. GROWTH

	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1980</u>	<u>1976-1981 AAGR</u>
Total Cromemco Revenue (\$ thousands)	\$ 600	\$4,000	\$11,000	\$30,000	
Annual Growth Rate (percent)		566%	175%	172%	268%

- Cromemco employs more than 400 people.

## 3. CURRENT PRODUCTS (PERSONAL COMPUTERS)

- Cromemco offers four computer systems, the System Zero, System Two, Model Z-2H, and the System Three.
- The Basic System Zero is suited to dedicated as well as general applications. It is a Z-80A-based single card computer. RAM memory ranges from 1K-byte to 64K; ROM memory is 8K-bytes. System Zero utilizes RDOS-2 as its operating system. Basic's price range during 1981 was \$995 to \$2,995.
- The System Two Disk Computer is a highly professional computer operating from the Z-80A CPU, utilizing RDOS-II operating system. The price of this unit is \$3,990.
- The Z-2H is a powerful system which includes 11 megabytes of hard disk storage, two quad-capacity floppy disk drives, 64K RAM memory, and the Z-80A processor. Z-2H operates off of the Cromix operating system which is similar to the UNIX operating system but with added features. This hard disk computer system retails for \$9,995.
- The System Three disk computer incorporates the Z-80A processor, up to four floppy disk drives, and memory expansion to 512-K RAM in eight banks. The

Cromix multi-user operating system is included also. Prices range from \$10,000 to \$16,000.

#### 4. DISTRIBUTION CHANNELS

- Cromemco distributes its products through a worldwide network of over 350 independently owned computer dealers and OEMs.

#### 5. FUTURE DIRECTIONS

- Cromemco announced the introduction of its 16-bit computer system during the spring of 1982. This system incorporates both the Motorola 68000 16-bit microprocessor and the Zilog Z-80A 8-bit microprocessor, making the system compatible with its existing Z-80 based product line. The 68000 based System One computer will range in price from \$5,495 to \$6,495. The System Three computer will range in price from \$8,495 to \$9,995.

#### G. ALTOS COMPUTER SYSTEMS

2360 Bering Drive  
San Jose, CA 95131  
(408) 946-6700

#### I. BACKGROUND

- Altos Computer Systems was founded in 1977 by British-born David Jackson. Altos is a designer of a family of systems based primarily on the Z-80A microprocessor. The computers are manufactured by Altos, and peripherals such as keyboard, printer, and visual display are obtainable from several different commercial sources. The philosophy of Altos is to fill the needs of a wide market; it accomplishes this goal by providing many options in hardware, software, and languages, which allow for easy upgrading.



## 2. GROWTH

	<u>1978</u>	<u>1981</u>	<u>1982</u>
Total Altos Revenue* (\$ thousands)	\$200	\$21,000	\$60,000**

\* San Jose Mercury News - 2/1/82, source of information

\*\* 1982 estimated FYE - revenues

## 3. CURRENT PRODUCTS

- Currently Altos is offering four basic configurations in the 8000 series: the ACS 8000-2, 8000-7, 8000-10, and 8000-15. They also offer a 16-bit machine, the ACS 16000-10.
- ACS 8000-2 comes with 6K RAM and provides up to 1M-bytes additional RAM with dual floppy disk drives. The Z-80A is 8000-2's microprocessor utilizing MP/M, CP/M, OASIS, or PASCAL as operating systems.
- ACS-8000-7 comes with 208K-bytes of RAM, expandable to a 29M-byte, hard disk, multi-user system with an integrated magnetic tape backup. The Z-80A is the microprocessor utilizing MP/M, CP/M or OASIS as operating systems.
- ACS-8000-10 comes with 208K-bytes of RAM expandable to 20-40M-bytes. The 8000-10 is a Z-80A based machine utilizing MP/M, CP/M, OASIS, and PL/C as operating systems.
- ACS-8000-15 is a Z-80A based machine offered with standard 208K-bytes of RAM memory. 8000-15 is upgradable to 8" or 14" hard disks. Operating systems available are the same as the 8000-10 with the Z-80A as its microprocessor.
- ACS-16000-10 is an Intel 8086-based machine which comes standard with 1m-byte of RAM memory. It has MP/M 86, CP/M 86, OASIS 86, and XENIX as its operating systems.

#### 4. DISTRIBUTION CHANNELS

- Altos sells its computers to OEMs and distributors who distribute in turn through a variety of networks.

#### 5. FUTURE DIRECTION

- Altos plans to introduce office computer systems that can connect hundreds of users at terminals located in separate buildings, all accessing the same data base.
- Altos plans to compete directly with Convergent Technologies by introducing a limited distributed-data processing system with individual terminals built around microprocessors.
- Altos plans to boost its system's power by adding the Motorola 68000 CPU. Altos wants both Intel's 8086 and the Motorola 68000 in order to capture as large a market share as possible.

#### H. NORTH STAR COMPUTERS, INC.

14440 Catalina Street  
San Leandro, CA 94577  
(415) 357-8500

#### I. BACKGROUND

- North Star Computers, Inc. is the industry's first company to announce a personal computer offering bit-mapped graphics. As of August 1981, approximately 30,000 North Star systems had been sold. North Star was founded in June 1976 by Charles A. Grant and Mark L. Greenberg. Both of these men are Ph.D.s who were originally staff members at U.C. Berkeley Research Center.

## 2. GROWTH

	<u>1977</u>	<u>1981</u>	<u>AAGR</u> <u>(percentage)</u>
Total North Star Revenue (\$ millions)	\$2.6*	\$25.0**	175%

\* First full year of North Star's operations

\*\* Estimate

## 3. CURRENT PRODUCTS

- North Star Computers, Inc. offers two very successful personal computers, the North Star "Horizon" and the "Advantage."
- The North Star Horizon was introduced in 1977, and it was one of the first small or personal computers to incorporate low-cost minidiskette capability. The Horizon utilizes a Z-80 microprocessor with one or two integrated double density or quad-capacity minidiskette drives. The operating systems include PASCAL which has its own operating systems, CP/M which supports both hard and floppy disk, and Disk Operating System (DOS 5.2) for disk systems. The price range of the Horizon is \$4,700 for the 32K-byte system with two double density diskette drives and a black and white screen, to \$14,000 for a 64K-byte system including a printer and two quad capacity diskette drives. Horizons are primarily used for scientific and business applications.
- The Advantage is aimed at the upper end of the office systems market providing graphics capability. The machine is Z-80 based with 64K-bytes of RAM and is capable of producing bar charts, pie charts, 3-D visuals, and plotted graphics. The operating systems included are Graphics DOS (disk-based) and CP/M. With graphics capability, the computing unit costs \$4,000. A typical configuration including 5M-bytes external disk storage and a letter quality printer costs about \$14,000.

#### 4. DISTRIBUTION CHANNELS

- North Star distributes both of its computers through distributors to dealers as well as OEMs. During 1981 Computerland became a major distributor. General Binding Company, a leader in specialized binding equipment, signed a \$25 million, three-year agreement with North Star to distribute Advantage and Horizon Computers under a private label.
- North Star has a direct distributor support facility located in Munich, Germany for European distribution.

#### 5. FUTURE DIRECTION

- North Star is striving to continue its current growth rate and expects to crest the \$200 million mark by 1985.
- In January 1982, MAI Sorbus Service contracted to provide third-party maintenance for North Star on an national basis.

#### 1. HEWLETT-PACKARD COMPANY

3000 Hanover Street  
Palo Alto, CA 94304  
(415) 857-1501

#### 1. BACKGROUND

- Hewlett-Packard is one of the major designers and manufacturers of precision electronics equipment for measurement, analysis, and computation in the world today. Hewlett-Packard produces more than 4,500 products which are sold worldwide and cover a broad spectrum of applications within the science, engineering, business, industry, medicine, and educational sectors.



- The primary product categories are computers/systems, calculators, computer/calculator peripheral products, test and measuring equipment, medical electronic equipment, and instrumentation for chemical analysis.
- Hewlett-Packard is ranked among the top U.S. industrial organizations for the proportion of sales dollars invested in product development. Hewlett-Packard invests 9 cents of every sales dollar in product development - approximately \$322 million for fiscal year 1981.

## 2. GROWTH

	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1977-1981 AAGR (percent)</u>
Total HP Revenue (\$ millions)	\$ 1,368	\$ 1,737	\$ 2,361	\$ 3,099	\$ 3,578	
Annual Growth Rate (percent)	22%	27%	36%	31%	15%	27%
Number of HP Employees (worldwide)				57,000	64,000	

## 3. CURRENT PRODUCTS (PERSONAL COMPUTERS)

- Hewlett-Packard currently offers three personal computers: the H/P 125, 83, and 85. All three computers are aimed at the professional market and cover a wide spectrum of applications.
- The H/P 125 was first introduced during the summer of 1981. It was intended to compete with IBM and Xerox in the personal computer market. The 125 utilizes CP/M as its operating system and is based on twin Z-80A microprocessors. The 125 is offered in two configurations: a dual 5¼" floppy disk with 500K-bytes of storage, or with dual 8" floppy disks and 2.4 megabytes of storage. The H/P 125 is priced at \$7,460 with the 5¼" dual floppy configuration.



- The H/P 83 and 85 are designed for industry/professional use with the ability to expand via peripherals and software as the users' needs develop. The 83 and 85 have an H/P solid state, 8-bit microprocessor, with 32K-bytes of RAM memory. These two computers use an H/P operating system. The H/P 83 with dual floppy disk is priced at \$3,600. The H/P 85 with dual floppy disk is priced at \$3,950. These two models also have 8" floppy disk and 5¼" Winchester flexible disk drives available to them.

#### 4. DISTRIBUTION CHANNELS

- Hewlett-Packard distributes its personal computers factory-direct through sales representatives and, occasionally, through OEMs .
- The only exception to this method is the new H/P-87 personal computer, which will have Computerland retail stores as a distributor.

#### 5. FUTURE DIRECTION

- Hewlett-Packard intends to be a major force in the personal computer world as evidenced by its most recently unveiled personals, namely, the H/P-87, and the H/P-9836 desk top.
- The H/P-87 is positioned to compete directly with the IBM Personal Computer and the Apple III. The 87 is designed for the analytical professional, which will include scientists and electronic engineers. The CPU for the 87 is a custom-designed 8-bit H/P-MC-6802 model. It has as its operating system, a CP/M plug-in module for \$495. The 87 system ranges in price from \$3,995 to \$7,995.
- The H/P 9836 A desk-top computer enables the user to gather, interpret, and graphically display data quickly. It greatly increases the range of computer-aided engineering application. With RAM PASCAL, 5¼" dual floppy disks, 256K-bytes RAM memory, and H/P VisiCalc, the top end price will be \$15,700.

## J. DIGITAL EQUIPMENT CORPORATION

146 Main Street

Maynard, MA 01754

(617) 897-5111

### 1. BACKGROUND

- Digital Equipment Corporation was founded in 1957. Its first Programmed Data Processor (PDP), the PDP-1, a high speed, 18-bit small computer with 32K of addressable core memory, was delivered in December 1959 at a price of \$120,000. PDP-2 and PDP-3 prototypes never reached the production stage.
- The first PDP-4 was delivered in 1962 with slower memory at a price of \$65,000.
- The PDP-5 has been acknowledged as the first commercially available business minicomputer. The 12-bit machine (the forerunner of the PDP-8) was introduced in 1963.
- The PDP-8 was announced in 1965 just as competition introduced systems comparable in price/performance to PDP-5.

### 2. GROWTH

	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1977-1981 AAGR (percent)</u>
Total Revenue (\$ millions)	\$1,059	\$1,437	\$1,804	\$2,368	\$3,198	
Annual Growth Rate (percent)		36%	26%	31%	35%	32%
Number of DEC Employees (thousands)	36.7	39.0	44.0	55.5	63.0	

### 3. CURRENT PRODUCTS

- DEC announced the PDP-9, PDP-10, and PDP-11 series, as well as the PDP-12 and PDP-14 in 1968 and 1969, respectively. There are several DEC minicomputers that can be configured as complete freestanding workstations, which include (prices are approximations):
  - PDP - 8/E - (8K CPU) tape drive, CRT and 30 CPS printer - \$14,865.
  - PDP - 11/03 - (16K plus dual floppy disk, DECWRITER 11) - \$10,000.
  - Datasystem 150 (32K) - \$10,900 or (60K user memory) \$11,600.
  - DECstation 78/40B - \$7,995; 78/70D - \$12,400 (both 16K)
  - DECstation 88/50-D (32K) - \$11,500, includes VT-100 CRT (88/50-L costs the same, but with LA180 printer added - \$14,400).

### 4. DISTRIBUTION CHANNELS

- DEC's computers will be sold in its own 25 retail stores, by DEC's sales force, and in stores franchised by Computerland.

### 5. FUTURE DIRECTION

- In the spring of 1982 DEC announced its entry into the personal computer market with three computers:
  - The Rainbow 100 is the least expensive of the three and will compete against the IBM and Apple personal computers. The Rainbow has two microprocessors: the 8-bit Z-80 and the 16-bit 8088 Intel chip. CP/M will be the operating system used. The price, with 64K RAM and 800,000 bytes of memory on the drives, will be \$3,495.

- Professional 350s and 325s are intended for business use only and can run the same software as DEC's PDP-11 minicomputer.
- The DECMATE II is a more powerful version of DEC's earlier word processing system and can also run the CP/M operating system.
- The price range of all three of these computers will be between \$3,000 and \$5,000.





## APPENDIX B: SOFTWARE VENDOR PROFILES



## APPENDIX B: SOFTWARE VENDOR PROFILES

### A. VISICORP

2895 Zanker Road  
San Jose, CA 95134  
(408) 946-9000

#### 1. BACKGROUND

- Since beginning in 1978 on a \$500 investment, Visicorp has become the world's leading producer of personal computer applications software. Its most popular and most recognizable software package, "VisiCalc," has sold in excess of 300,000 copies since 1979.
- VisiCalc is directly responsible for opening up the business market to personal computers.
- Visicorp is a privately held company with the majority of its ownership held by employees.

#### 2. GROWTH

	<u>1980</u>	<u>1981</u>
- Total Visicorp Revenue (\$ millions)	\$ 4	\$ 20
- Annual Growth Rate (percent)	-	400%
- Number of Employees	-	100+

### 3. CURRENT PRODUCTS

- VisiCalc software is an electronic worksheet which enables the user to execute calculations in a row-and-column format. VisiCalc can be used on the Apple II and III, Commodore 2001 and 8032, TRS-80 II and III, IBM's Personal Computer, Hewlett-Packard's 125, and the Xerox 820.

### 4. DISTRIBUTION CHANNELS

- Visicorp, without a doubt, has the largest distribution network in the industry. The dealer network alone includes over 2,200 independent domestic computer retail stores, the 8,000-store Radio Shack chain, the recently established IBM and Xerox retail outlets, the franchise networks of Computerland and Team Electronics, Sears Roebuck & Company, and another 1,000 retail stores outside the U.S.

### 5. FUTURE DIRECTION

- Visicorp's targeted market now includes the Fortune 1,000 companies' professionals at all levels, small business professionals, lawyers, doctors, and an array of other professionals involved in management tasks.
- Industry analysts have speculated that Visicorp may be a candidate for going public over the next two years, based on the company's appraised worth of about \$125 million.

## B. MICROPRO INTERNATIONAL CORPORATION

1299 4th Street  
San Rafael, CA 94901  
(415) 457-8990

### 1. BACKGROUND

- Seymour Rubinstein founded MicroPro in September 1978 and began by selling software in a booth at a microcomputer exhibition in New York City.
- In 1979, MicroPro introduced WordStar, an early alternative to single-purpose word processing systems. WordStar is ranked as the top-selling word processing program for microcomputers, based on the number of units sold in retail stores throughout the U.S.
- In March 1981 the Adler Group invested \$1 million in MicroPro in return for 25% of the company.

### 2. GROWTH

	<u>1980</u>	<u>1981</u>
- Total MicroPro Revenue (\$ thousands)	\$1,800	\$5,000
- Annual Growth Rate (percent)		177%
- Number of Employees		400

### 3. CURRENT PRODUCTS

- All MicroPro software is designed to run on CP/M and most CP/M-derivative operating systems. MicroPro is converting its software for compatability with operating systems found on the newer, more powerful 16-bit microcomputers, such as CP/M-86, MS-DOS, and UNIX.



- WordStar is a highly versatile word processing package now known as the de facto standard for personal computers. The CP/M version costs \$495; the Apple version costs \$375. The Apple version requires substantial add-on peripherals.
- MailMerge is a powerful, multipurpose, file-merging program used with WordStar. The CP/M version is \$150; the Apple version, \$125.
- SpellStar is a spelling program that works with WordStar to find and correct spelling and typing errors in word processing. The CP/M version is \$250; the Apple version is \$195.
- DataStar is a data-handling program that allows one to enter, retrieve, and update data. DataStar interacts with WordStar, MailMerge, and SuperSort programs. The CP/M version is \$350; the Apple version, \$295.
- SuperSort is used for high-speed sorting, merging, and selecting information from data files with great flexibility. The CP/M version of SuperSort I is \$250, the SuperSort II, \$225; the Apple version SuperSort I is \$200, SuperSort II, \$150.
- WordMaster is a video text editor used mainly by programmers. The CP/M version is \$150.
- CalcStar is an electronic spreadsheet. The CP/M version is \$295; the Apple version, \$195.
- Apple II versions require the Microsoft Z-80 CP/M Soft Card, an 80-column video board, and 16K of additional RAM.
- Most MicroPro software programs are provided in 5¼" single density disk format.

#### 4. DISTRIBUTION CHANNELS

- MicroPro distributes its product to over 1,000 dealers in the U.S. It also distributes to 27 other countries through distributors with established dealer networks, OEMs, and large volume users which include education, government, and manufacturers who bundle MicroPro products with their computers.

#### 5. FUTURE DIRECTION

- During the spring of 1982, MicroPro released "InfoStar," a powerful report generator/file processor with data handling capabilities.
- MicroPro is beginning to design its software for operation on several different operating systems in an effort to avoid being tied exclusively to CP/M hardware.

#### C. MICROSOFT, INC.

10800 N.E. Eighth, Suite 819  
Bellevue, WA 98004  
(206) 455-8080 Telex 328945

#### I. BACKGROUND

- Microsoft began in 1975 with a single product, a BASIC interpreter for the 8080 personal computer. The Microsoft BASIC language now has 725,000 installations, more than any other single piece of software.
- Microsoft, Inc. designs, writes, and sells systems software for 8-bit and 16-bit microprocessors.
- Microsoft, Inc. was founded by Bill Gates and Paul Allen in 1975 when Bill Gates was 18 and Paul Allen was 21.

- Microsoft is made up of two divisions: the Microsoft OEM Division and Microsoft Consumer Products Division. The two divisions were formed to handle the distribution of software through these particular channels.
- On September 20, 1981, Microsoft received \$1 million of venture capital from Technology Venture Investors, a company based in Menlo Park, California.

## 2. GROWTH

	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
Total Revenue (\$ thousands)	\$500	\$1,000	\$2,500	\$7,500	\$16,500
Annual Growth Rate (percent)		100%	150%	200%	120%
Number of Employees				85	130

## 3. CURRENT PRODUCTS

- Microsoft's revenue is derived from its software products and Softcard, a plug-in processor which allows Apple II and II+ owners to use software written for CP/M-based computers.
- Microsoft sells systems software packages for 8-bit and 16-bit personal computers, including languages, utilities, language subsets, and operating systems.
- The Consumer Product Division manufactures software in disk and cassette formats which include documentation. The products are described as follows:
  - Disk formats are 8" single side, single density; 5¼" single side, double density; and 5¼" standard format.
  - Software is offered for the CP/M, Apple DOS, TRS-80, ISIS-II, and TEKDOS operating systems.

- Language products offered are as follows:

- BASIC-80 is an implementation of BASIC for 8080 and Z-80 microprocessors. With over one million installations, it is the leading BASIC interpreter used on most 8-bit microcomputers. BASIC-80 costs \$350.
- BASIC Compiler increases the execution speed of programs run on BASIC-80 by three to ten times. BASIC Compiler costs \$395.
- COBOL-80 is an Implementation COBOL which offers improved interactive and user friendly capabilities over standard COBOL. COBOL-80 costs \$750.
- FORTRAN-80 offers relocatable modules that are linked and loaded at run time. FORTRAN-80 costs \$500.
- M/Sort is a sort utility which sequences records by a set of data keys supplied by the programmer. M/Sort allows full choice in the number and arrangement of sorting categories. M/Sort costs \$150.
- Softcard is a hardware/software plug-in card for Apple IIs and II+s. It includes a Z-80 CPU and CP/M software. Softcard enables the Apple computer to operate any software developed for CP/M. Softcard costs \$300. Forty thousand units have been sold since Softcard's introduction during the summer of 1980.
- Level III BASIC is an enhancement for Radio Shack's TRS series. Level III costs \$49.95.
- Editor/Assembler-Plus is an editing, assembling, and debugging package for TRS-80 systems. Its cost is \$29.95.
- Apple A.L.D.S. is an assembly language that enables programming in three different assembly languages: Z-80, 8080, 6502. It costs \$100.

- MicMath-80 symbolic math package allows a personal computer to perform algebra, trigonometry, calculus, integration, differentiation, and transcendental functions. MisMath-80 costs \$250.
- Microsoft's OEM Division licenses software products to microcomputer OEMs, who sell their products with Microsoft software bundled in. OEMs may also license software for their own use in product development. Over 250 OEMs use Microsoft software, including IBM, DEC, HP, TI, Apple, Radio Shack, Xerox, Matsushita, Mostek, Commodore, and Lanier. Operating systems offered to OEMs are Xenix and MS-DOS.
  - Xenix is a 16-bit CPU adaptation of Bell Laboratories' UNIX system.
  - MS-DOS is a disk-operating system for 8086/8088 16-bit microprocessors.

#### 4. DISTRIBUTION CHANNELS

- Distribution of products is achieved through dealers, distributors, OEMs, and mail order.

#### 5. FUTURE DIRECTION

- Microsoft announced a major series of applications tools for 1982:
  - Time manager, a personal calendar.
  - Project manager, a program for small project control.
  - Personnel manager, a data base management system for names.
- Xenix and MS-DOS will possibly be enhanced during 1982.



- In particular, MS-DOS will include disk buffering, graphics and cursor positioning, kanji support, multi-user and hard disk support, and networking.

#### D. LIFEBOAT ASSOCIATES

1651 Third Avenue  
New York, NY 10028  
(212) 860-0300

##### 1. BACKGROUND

- Lifeboat Associates is an important publisher and distributor of proprietary software founded in 1977 by Tony Gold and Larry Alkoff.
- Lifeboat Associates is a mail-order retailer of software products for personal computers, primarily, and operating systems for minicomputers, secondarily.

##### 2. GROWTH

	<u>1980</u>	<u>1981</u>
- Total Lifeboat Revenue (\$ thousands)	\$5,000	\$10,000
- Annual Growth Rate (percent)		100%

##### 3. CURRENT PRODUCTS

- Lifeboat's library of software is too extensive to list individual packages; therefore, generic categories will be given with a systems requirement at the end of the section.
  - Systems tasks.
  - Telecommunications.

- Languages.
  - Languages and application tasks.
  - Word processing systems and aids.
  - Data management systems.
  - General-purpose applications.
  - Mailing list systems.
  - Financial accounting packages.
  - Numerical problem-solving tools.
  - Professional and office aids.
  - Disk operating systems (8- and 16-bit machines).
  - OEM services and products.
- The minimum personal computer system requirements for Lifeboat's software products are:
    - Operating systems: SB-80 or CP/M-80 (1.3 or later) or a compatible derivative.
    - Microprocessor: 8080/8085/Z-80 system.
    - Memory: 48K-bytes.

- Disk storage: 70K-bytes minimum.
- Disk drives: two drives.
- Any differences in the above requirements are identified by product.

#### 4. DISTRIBUTION CHANNELS

- Lifeboat Associates is a publisher and distributor of proprietary software. It distributes its several hundred software packages by mail order to the following customers: end users, dealers, distributors, authors, and OEMs. Lifeboat Associates also provides the following services to its customers:
  - Fully tested, reliable software.
  - Wide spectrum of computer formats.
  - Technical service "hot line."
  - Customer service department providing facilities for mail, telephone, TWX, Telex, and personal sales.
  - Offices on three continents.
  - Export service delivering software to six continents.
  - Growing network of dealers.
  - Software desk reference.
  - A monthly magazine covering new products, new versions, tips for personal computer users, and feature articles guiding the reader before and after purchase.

## 5. FUTURE DIRECTION

- Dealers have recently been allowed to receive discounts from Lifeboat without a minimum order on the number of software programs. This new program reduces bookkeeping and gives retailers more effective inventory control.

## E. DIGITAL RESEARCH, INC.

Box 579

160 Central Avenue

Pacific Grove, CA 93950

(408) 649-3896

## I. BACKGROUND

- In 1976 Gary Kildall founded Digital Research, Inc. Within three years CP/M (which Kildall created) was to become the primary product of his own million dollar company and the standard operating system for Z-80- and 8080-based personal computer systems.
- When Kildall originally developed CP/M, he anticipated that Intel would grasp the opportunity to fund further development of it as an Intel product, but Intel turned the project down.
- In August 1981 a four-way capital financing agreement was drawn up with venture capitalist/investment bankers - TA Associates, Hambrecht and Quist, Venrock Associates, and Page Mill Partners.
- In September 1981 Digital Research acquired Compiler Systems, Inc.
- In November 1981 Digital acquired MT Microsystems, Inc. of San Diego for an undisclosed amount of cash. Digital will market MT's PASCAL/MT plus programming language.

## 2. GROWTH

	<u>1980</u>	<u>1981</u>
- Total Digital Revenue (\$ thousands)	\$3,500	\$6,000
- Annual Growth Rate (percent)		71%
- Number of Employees	16	80

## 3. CURRENT PRODUCTS

- Digital produces the industry standard CP/M-80 and CP/M-86 operating system, the multi-user operating system, MP/M II, and a source code conversion program called XLT-86.
- CP/M-80 was first installed in June 1975, and as of June 1982, Digital Research reports approximately 350,000 installations. CP/M-80 can be installed on any Intel 8080/8085, Zilog Z-80, or compatible microprocessor system with a minimum of 20K-bytes of main memory. Diskettes are required for backup memory. CP/M-80 sells for about \$135.
- CP/M-86 was first installed in January 1981, and while Digital is unable to approximate the number of installations, CP/M-86 is sold to over 40 OEMs, is sold directly from Digital, and is distributed within a 300-dealer network. CP/M-86 is available for the Intel 8086/8088 microprocessor system with a minimum of 32K-bytes of main memory. Diskettes are required for backup storage. CP/M-86 sells for about \$250 with documentation.
- MP/M-II is an 8-bit multitasking operating system which incorporates file-and record-locking, password protection, and increased disk-handling capacity. MP/M-II also permits 16 logical drives on-line simultaneously, and each drive has a capacity of as much as 512 M-bytes. A total of 4 G-bytes of on-line storage is therefore available to the user. MP/M-II will run on any Z80, 8080,



or 8085-based system and can manage up to 400K-bytes of user memory, although it only takes up about 16K-bytes. MP/M-II costs about \$450.

- XLT-86 is an analytical translator program written in PL/I-80. It reads the entire 8080 source program, assembles it to machine code, analyzes the register, memory, and flag utilization, and emits an optimized 8086 assembly language program. The XLT-86 sells for \$150. The system requirements are:
  - 8080/Z80-based systems.
  - CP/M 1.4 or 2.2 or MP/M or MP/M-II.
  - 40K RAM.
  - One disk drive.

#### 4. DISTRIBUTION CHANNELS

- According to Digital Research, 80% of its products are sold through OEMs like IBM and Altos. The remaining 20% are sold by manufacturer-direct selling and by a network of 300 dealers.

#### 5. FUTURE DIRECTION

- Digital plans to introduce MP/M-86, the 8086 compatible version of MP/M-80. MP/M-86 will be competing against the UNIX system in the 16-bit marketplace.
- Digital is in the process of creating an extensive distributor network for its products. For example, during December 1981 Digital consummated a deal with the world's largest distributor of electronic parts, Hamilton-Avnet.

## F. SOFTWARE PUBLISHING CORPORATION

1901 Landings Drive  
Mountain View, CA 94043  
(415) 962-8910

### 1. BACKGROUND

- Software Publishing Corporation's Personal Filing System (PFS) is second only to VisiCalc as the all-time best seller with 70,000+ packages sold to date.
- Software Publishing Corporation was founded in 1980 by Fred Gibbons. In the company's first year its revenues were \$1 million.
- The products and the company's objectives are directed at the novice and the first-time user of personal computers.
- During May 1981 Melchor Venture Management supplied \$250,000 of capital to Software Publishing. During May 1982 Melchor Venture Management and others again supplied venture capital to Software Publishing.

### 2. GROWTH

	<u>1981</u>	<u>1982*</u>
- Total Company Revenue (\$ millions)	\$ 1	\$ 4
- Annual Growth Rate (percent)		300%
- Number of Employees	8	25 (as of 6/1)

\* Estimate

### 3. CURRENT PRODUCTS

- PFS is Software Publishing's top selling software package with more than 70,000 units. PFS is an information management product which works like a

paper-filing system. PFS allows the end user to record, file, retrieve, and summarize information very quickly. PFS was introduced in September 1980.

- PFS: REPORT is the report generator for PFS, introduced in May 1981.
- PFS: GRAPH is a graphics package that is compatible with PFS and VisiCalc. It was introduced in May 1982.
- Systems requirements:
  - All three PFS products operate off UCSD PASCAL and the Apple II and III personal computers.
  - 48K RAM is minimum.
  - PFS and PFS: GRAPH need only one disk drive.
  - PFS: REPORT requires a dual disk configuration.
- The systems prices are:

	<u>Apple II</u>	<u>Apple III</u>
- PFS	\$125	\$175
- PFS: REPORT	\$ 95	\$125
- PFS: GRAPH	\$125	not offered yet

#### 4. DISTRIBUTION CHANNELS

- Software Publishing's products are sold through Apple authorized dealers. About 75% of the PFS systems are sold to distributors.

## 5. FUTURE DIRECTION

- To obtain more product distribution control from distributor to dealer, SP is making some restrictive changes (complete details are not available). SP is contracting manufacturing representatives to sell their products directly to dealers, as one measure.
- SP will be offering its products on machines which are top sellers. Tandy and IBM versions are likely to be available in late 1982 or early 1983.

## G. SORCIM CORPORATION

405 Aldo Avenue  
Santa Clara, CA 95050  
(408) 727-7634

## I. BACKGROUND

- Richard Frank and Paul McQueston began in 1976 as a consulting company designing software for individual clients. In 1980 Frank and McQueston created Sorcim Corporation, a microcomputer software company. Perhaps Sorcim's greatest strength lies in its abundance of highly experienced technical programmers. Sorcim is a privately held corporation.
- Sorcim Corporation has received venture capital from Melchor Venture Management.

## 2. GROWTH

	<u>1981</u>	<u>1982*</u>
- Total Sorcim Revenue (\$ millions)	\$1.5	\$3.0
- Annual Growth Rate (percent)		100%
- Number of Employees	25	50 (as of May 1982)

\* Estimate

## 3. CURRENT PRODUCTS

- SuperCalc is an electronic spreadsheet which allows development of financial and engineering applications without knowledge of a programming language. SuperCalc requires CP/M-80-2.2 or MS-DOS for 8-bit machines and will soon be available on CP/M-86. A minimum of 48K RAM memory and dual diskettes are needed as well. SuperCalc's price is \$295.
- PASCAL/M is a compiler which generates compact P-code. PASCAL/M features CP/M compatible I/O strings extensions similar to UCSD PASCAL, segmented procedures which allow memory saving overlays, external procedures which enable use of machine language routines, 600 lines/minute compilation speed, 14-digit BCD arithmetic, full-floating point, and a symbolic debugger. PASCAL/M is designed for the 8080 and Z-80 microprocessors and requires CP/M-80-2.2, and 56K RAM memory. PASCAL/M costs \$395.
- A.C.T. is a cross-assembler family which allows a user to assemble source code for a variety of processors. Assembly speed is greater than 1,000 lines per minute, and output is Intel format hex file.
  - The A.C.T. processor families include:
    - . A.C.T. 65 - 6502, Mostek mnemonics.



- . A.C.T. 68 - 6800/6801, Motorola mnemonics.
- . A.C.T. 69 - 6809, Motorola mnemonics.
- . A.C.T. 80 - 8080-8085/Z-80, Intel 8080 mnemonics, Sorcim superset of 8080 mnemonics for Z-80.
- . A.C.T. 86 - 8086/8088, Sorcim mnemonics.
- Each assembler runs under CP/M, CDOS and requires one disk drive and 24K RAM memory.
- Trans 86 is a code translator which specifically translates 8080/Z80 source code to 8086/8088 source code. Trans 86 requires CP/M, one disk, and 48K RAM. Trans 86 costs \$125.

#### 4. DISTRIBUTION CHANNELS

- Sorcim relies on distributors, dealers, and mail order as its primary means of product distribution.
- Sorcim's major dealer is Computerland.
- Sorcim has 30 distributors, some of which are Leading Edge, Hamilton-Avnet, Byte, CPU, Computer Innovation.

#### 5. FUTURE DIRECTION

- Sorcim will be making an effort to support a larger variety of processors with its software product offerings.
- Sorcim plans to introduce a word processing system called Super Writer. Super Writer will offer automatic spelling check, mailing and merging, and full

editing capabilities. Super Writer will be available on 8086/MS-DOS machines with dual disk at \$395.

- Sorcim also plans to enlarge its dealer/distributor network significantly.

#### H. SOFTSEL COMPUTER PRODUCTS, INC.

8295 South La Cienega Blvd.  
Inglewood, CA 90301  
(213) 670-9461

##### 1. BACKGROUND

- Softsel is the largest independent "software only distributor" for personal computers in the world today.
- Softsel was incorporated in October 1980 by Bob Lefs and Dave Wagman (Chairman of the Board).
- Softsel began, literally, as a part-time garage organization and has grown without investment ever since. Softsel is wholly owned as a private company by Mr. Lefs and Mr. Wagman.

##### 2. GROWTH

- In its first year of business Softsel registered \$15 million in sales.
- Until now, Softsel has grown at a rate greater than 100% per quarter over 20 months.
- Softsel began in 1980 with two employees and now has 70.
- Softsel is anticipating \$25 million in revenue for fiscal year 1982.

- Approximately 65% of Softsel's revenue is derived from business and professional software sales. The remaining 35% is recreational software.

### 3. CURRENT PRODUCTS

- Softsel is Visicorp's single largest customer worldwide, and VisiCalc is Softsel's biggest selling package. In fact, in every case where Softsel represents the publisher, Softsel is that publisher's single largest customer. Softsel also represents companies like Microsoft, MicroPro, and Automated Simulation.
- Softsel represents over 100 publishers (none of which are proprietary), which accounts for over 1,700 different products. Of these, Softsel sells more Microsoft, Inc. products than any other. It sells millions of dollars worth annually.
- Softsel software runs on Apple, Atari, IBM, Commodore, NEC, various CP/M systems, and TRS-80 series computers.
- Softsel receives about six unsolicited submissions of software daily. They are all evaluated, and Softsel adds 100 new products monthly as a result.

### 4. DISTRIBUTION CHANNELS

- Softsel distributes to about 1,500 retail stores worldwide. Computerland is a Softsel customer.

### 5. FUTURE DIRECTION

- Softsel has just opened a service office to support its dealers in Chicago, along with a warehouse in New Jersey.
- Headquarters is moving to a 70,000 square foot building in Southern California, and there are plans to open several service offices in the U.S. and Europe this year.

- Softsel will acquire a great deal of software this year for the Commodore VIC 20.
- Softsel is investigating new merchandising techniques, which include video displays, and new methods of merchandising on the floor.

APPENDIX C: SELECTED LIST OF PERSONAL  
COMPUTERS





## SELECTED LIST OF PERSONAL COMPUTERS

COMPANY	PROCESSOR	OPERATING SYSTEM	COMPUTER MODEL	AMOUNT OF RAM	TYPE OF MASS STORAGE	PRICE WITH CPU, TWO MASS STORAGE DEVICES
Basic Four Info. Systems	Z80	Boss Level 5	S/10 Portable	64K	2-5 $\frac{1}{4}$ " Floppies	\$7,500
Cromenco, Inc.	Z80/MC68000	Cromix/CP/M	CS-1 D2E	256K	2-5 $\frac{1}{4}$ " Floppies	\$6,250 w/Terminal
Delta Products	Z80	CP/M	52500-01, 51000-17 + Ramcard	128K	2-8" Floppies	\$5,000
DigiLog Business Systems	Z80	CP/M or Turbo DOS	Digilog System 1000 Model 2	64K	2-5 $\frac{1}{4}$ " Floppies	\$5,750
Digital (DEC) Equipment Corp.	Z80/8088	CP/M	Rainbow 100	64K	2-5 $\frac{1}{4}$ " Floppies	\$3,500
Digital Technology, Int.	Z80	CP/M	Proprietary Until Release	128K	2-5 $\frac{1}{4}$ " Floppies	\$4,200 w/Graphics and Monitor
EPIC Computer Corp.	Z80	CP/M	Episode	64K	1-5 $\frac{1}{4}$ " Floppy 1-Hard Disk	\$7,200
Exidy Systems, Inc.	Z80	CP/M	Sorcerer	48K	2-5 $\frac{1}{4}$ " Floppies	\$6,900 w/Printer Display
Lanier	Z80	Lexis	Computereze	128K	2-5 $\frac{1}{4}$ " Floppies	\$7,000 w/Printer
Micro Computer Tech., Inc. (MIT)	Z80	LDOS; DOS; TRSDOS; NEWDOS; 80	MOD III/ Winchester	48K	1-5 $\frac{1}{4}$ " Floppy 1-Hard Disk	\$5,500
NEC Home Electronics	Z80		PC8001	160K	2-5 $\frac{1}{4}$ " Floppies	\$4,750 w/Color Monitor

Continued

APPENDIX C (Cont.)  
SELECTED LIST OF PERSONAL COMPUTERS

COMPANY	PROCESSOR	OPERATING SYSTEM	COMPUTER MODEL	AMOUNT OF RAM	TYPE OF MASS STORAGE	PRICE WITH CPU, TWO MASS STORAGE DEVICES
NNC Electronics	Z80	CP/M	80W	64K	1-8" Floppy 1-Hard Disk	\$10,000 w/Display
Onyx Systems, Inc.	Z80	Oasis or CP/M	Sundance	64K	1-Hard Disk + 1-Cartridge Tape Drive	\$8,500
Radio Shack	Z80	TRSDOS	Model II	64K	2-8" Floppies	\$5,000 w/Display
Radio Shack	Z80	TRSDOS	Model III	48K	2-5 $\frac{1}{4}$ " Floppies	\$2,500 w/Display
Systems Group	Z80	CP/M	Systems 2812	64K	2-8" Floppies	\$6,100 w/Display
Vector Graphics, Inc.	Z80	CP/M	2600	64K	2-5 $\frac{1}{4}$ " Floppies	\$5,250
Wang Laboratories	Z80	CP/M	Wangwriter	128K	2-5 $\frac{1}{4}$ " Floppies	\$7,750 w/Printer
Zenith Data Systems	Z80		Z90	64K	1-8" Floppy 1-Hard Disk	\$9,000
IBC/Integrated Bus. Computers	Z80B	MP/M; CP/M; Oasis; Sands; (MOT)	Cadet	64K	2-8" Floppies	\$5,500
Ithara Intersystems	Z80B	CP/M	Single-User System	64K	2-5 $\frac{1}{4}$ " Floppies	\$6,000 w/Terminal
Tel, Inc.	Z80B	Magic, CP/M	Systems 480L	128K	1-Hard Disk (1-Floppy or Cartridge is Optional)	\$6,000
Teleram	Z80L	CP/M	Small Wonder	64K		\$3,000 w/Display

Continued

## SELECTED LIST OF PERSONAL COMPUTERS

COMPANY	PROCESSOR	OPERATING SYSTEM	COMPUTER MODEL	AMOUNT OF RAM	TYPE OF MASS STORAGE	PRICE WITH CPU, TWO MASS STORAGE DEVICES
Altos	Z80-A	CP/M or Oasis	Series 5-15D w/ Altos-1 Terminal	196K	2-5 $\frac{1}{4}$ " Floppy	\$5,000
Applied Digital Data, Inc.	Z80-A	Muon CP/M	Multivision 2 Viewpoint Term.	64K	2-5 $\frac{1}{4}$ " Floppies 1-Hard Disk	\$9,500
Archives, Inc.	Z80-A	CP/M	Model 1	64K	2-5 $\frac{1}{4}$ " Floppy	\$5,500
BMC Computer Corp.	Z80-A	CP/M	Model 208	64K	2-5 $\frac{1}{4}$ " Floppy	\$8,000 w/ Integrated Printer
California Computer Systems	Z80-A	CP/M	System 300-3 Ampex Terminal	64K	2-8" Floppies	\$5,500
Columbia Data	Z80-A		964 +	64K	2-5 $\frac{1}{4}$ " Floppies	\$5,000
Control Data	Z80-A	CP/M	110	64K	2-8" Floppies	\$6,550
Digital Microsystems	Z80-A	CP/M	DSC-3/F Fox	64K	2-5 $\frac{1}{4}$ " Floppies	\$3,995 w/Display
Dynabyte	Z80-A	CP/M	Model 5305-A1 w/ADDS Viewpoint Terminal	64K	2-8" Floppies	\$5,750
Eagle Computer, Inc.	Z80-A	CP/M	Eagle IV	64K	1-5 $\frac{1}{4}$ " Floppy 1-Hard Disk	\$9,000 w/Acctg. & DBM Software
Findex (Division of ATV)	Z80-A	CP/M or Big-00S	9x1	80K	2-5 $\frac{1}{4}$ " Floppies	\$7,750 w/Printer & Display

Continued



# APPENDIX C (Cont.)

## SELECTED LIST OF PERSONAL COMPUTERS

COMPANY	PROCESSOR	OPERATING SYSTEM	COMPUTER MODEL	AMOUNT OF RAM	TYPE OF MASS STORAGE	PRICE WITH CPU, TWO MASS STORAGE DEVICES
Hewlett-Packard Co.	Z80-A	CP/M + Proprietary	HP-125 Model 10	64K	2-5¼" Floppies	\$5,000
Hewlett-Packard Co.	Z80-A + Series 80 CPU		HP-87	64K w Z80 48K w 80 Series CPU	2-5¼" Floppies	\$5,000
IMS International	Z80-A	CP/M, MP/M Turbo DOS	5000 SX	64K	2-5¼" Floppies	\$5,250 w/Terminal
Intertec Data Systems	Z80-A	CP/M	Compustar VPU-40	64K	2-5¼" Floppies	\$5,000
Jonos, Ltd.	Z80-A	CP/M	Courier	64K	2-3.5" Floppies	\$4,750 w/Display & Printer
North Star Computer	Z80-A	Graphics CP/M; Graphics DOS/BASIC	Advantage	64K	1-5¼" Floppy 1-Hard Disk	\$6,500
Otrona	Z80-A	CP/M	Attaché	64K	2-5¼" Floppies	\$4,000 w/Display
Prodigy Systems, Inc.	Z80-A	Protege	Prodigy System 1	64K	2-8" Floppies	\$10,000
Radio Shack	Z80A/68000	Proprietary for 68000; TRS DOS for Z80A	Model 16	128K	2-8" Floppies	\$5,775
Sharp Electronics Corp.	Z80-A	CP/M, FDOS	YX3200 System 200	64K	2-8" Floppies	\$6,550
Telecon Industries	Z80-A	CP/M	Future 1	64K	2-5¼" Floppies	Not Available

Continued



## SELECTED LIST OF PERSONAL COMPUTERS

COMPANY	PROCESSOR	OPERATING SYSTEM	COMPUTER MODEL	AMOUNT OF RAM	TYPE OF MASS STORAGE	PRICE WITH CPU, TWO MASS STORAGE DEVICES
Televideo Systems, Inc.	Z80-A	CP/M	TS802H	64K	1-5 $\frac{1}{4}$ " Floppy 1-Hard Disk	\$7,000
Tarbell Electronics	Z80-A	CP/M	Empire 2	64K	2-8" Floppies	\$6,000
Alpha Microsystems	MC 68000	AMOS	Proprietary Until Release	Not Reported	1-5 $\frac{1}{4}$ " Floppy 1-Hard Disk	>\$5,000
Compu/Think	MC 68000	CTOS; DOS; Fortran; Pascal; & Merlin	Eagle 32 Model 10	128K	2-5 $\frac{1}{4}$ " Floppies	\$7,500
Corvus Systems	MC 68000	Pascal	Concept	512K	2-5 $\frac{1}{4}$ " Floppy Winchester Drives	\$5,000
Cromemco, Inc.	MC68000/Z80	Cromix/CP/M	CS1 DZE	256K	2-5 $\frac{1}{4}$ " Floppies	\$6,250 w/Adds Terminal
Dual Systems	MC 68000	Unix	83-06	256K	2-8" Floppies	\$9,500
Fortune Systems	MC 68000	Unix	32/16	128K	2-5 $\frac{1}{4}$ " Floppies	\$6,000
Radio Shack	MC 68000/Z80A	Not Reported for 68000, TRS DOS for Z80A	Model 16	128K	2-8" Floppies	\$5,750
Three Rivers Computer	MC 68000	CP/M	PERQ	1024K	1-Hard Disk 1-Floppy 8"	\$29,200
Wicat Systems, Inc.	MC 68000	MCS; UNIX; CP/M	System 150 FS	256 K	2-5 $\frac{1}{4}$ " Floppies	\$6,000

Continued

APPENDIX C (Cont.)  
SELECTED LIST OF PERSONAL COMPUTERS

COMPANY	PROCESSOR	OPERATING SYSTEM	COMPUTER MODEL	AMOUNT OF RAM	TYPE OF MASS STORAGE	PRICE WITH CPU, TWO MASS STORAGE DEVICES
Apple	6502	Apple-DOS	II	64K	2-5 $\frac{1}{4}$ " Floppies	\$3,250 w/Display
Apple	6502	DOS;SOS; Pascal; CP/M	III	128K	1-5 $\frac{1}{4}$ " Floppy 1-Hard Disk	\$7,500
Atari	6502	AOS	800	48K	2-5 $\frac{1}{4}$ " Floppies	\$3,100 w/Display
Commodore International	6502	Not Given	SuperPET	96K	1-5 $\frac{1}{4}$ " Floppy 1-Hard Disk	\$5,750
Franklin Computer Corp.	6502	Apple DOS or CP/M	ACE-100	64K	2-3.5" Diskettes	\$1,495
Franklin Computer Corp.	6502	Apple DOS or CP/M	ACE-1000	64K	2-3.5" Diskettes	\$1,595
Ohio Scientific, Inc.	6502	OS-65D DOS V31	Challenger 2 Series 2	48K	2-5 $\frac{1}{4}$ " Floppies	\$5,000 w/Display
Ohio Scientific, Inc.	6502	Not Given	C2-D	48K	1-5 $\frac{1}{4}$ " Floppy 1-Hard Disk	\$8,550 w/Terminal
Canon USA, Inc.	6809	Proprietary	CX-1	64K	2-5 $\frac{1}{4}$ " Floppies	\$5,000
Commodore International	6809/6502		SuperPET	96K	1-5 $\frac{1}{4}$ " Floppy 1-Hard Disk	\$5,750
Smoke Signal Broadcasting	6809	DOS 69D; Flex; 059	Chieftan 9524	64K	2-5 $\frac{1}{4}$ " Floppies	\$5,250 w/Terminal
Epson America	6301	MS-Basic	HX-20	16K	No Disk Storage at This Price	\$800
A.B. Dick Co.	8085	CP/M	Magnawriter	80K	2-5 $\frac{1}{4}$ " Floppies	\$6000

Continued

APPENDIX C (Cont.)  
SELECTED LIST OF PERSONAL COMPUTERS

COMPANY	PROCESSOR	OPERATING SYSTEM	COMPUTER MODEL	AMOUNT OF RAM	TYPE OF MASS STORAGE	PRICE WITH CPU, TWO MASS STORAGE DEVICES
Pertec Corporation	8085	CP/M	PCC 2000	64K	2-8" Floppies	\$10,000
Xerox	8085		860	128K	2-8" Floppies	\$7,875
Durango Systems, Inc.	8085A	DX 85 H or CP/M Star Basic	800	64K	2-5¼" Floppies	\$8,250 w/Dot Matrix Printer
Toshiba Information Systems	8085A	CP/M	Model 4 T250	64K	2-8" Floppies	\$7,000
Burroughs Corp.	8086	CTOS	B-20	128K	2-5¼" Floppies	\$8,000
Eagle	8086	CP/M; MP/M; Oasis-16; Xenix	BC-1610	128K	2-5¼" Floppies	\$5,000 & Up
Eagle	8086	MS-DOS; IRMX86 (Both Machines)	BC-1630	512K	1-5¼" Floppy 1-Hard Disk	\$9,000 w/Display
Convergent Technology	8086	CP/M	B-20	128K		\$5,000-\$10,000
NCR Corp.	8086	CTOS	Work saver	256K	2-5¼" Floppies	<\$8,000
Savin Information Systems	8086	CTOS	IS-1000	256K	2-5¼" Floppies	\$7,750
DEC	8088/Z80	Proprietary / CP/M	Rainbow 100	64K	2-5¼" Floppies	\$3,500
IBM	8088	Built into Hardware	Personal Computer	256K	2-5¼" Floppies	\$5,250
IBM	8088	Proprietary	Displaywriter	160K	2-8" Floppies	\$6,000

Continued



# APPENDIX C (Cont.)

## SELECTED LIST OF PERSONAL COMPUTERS

COMPANY	PROCESSOR	OPERATING SYSTEM	COMPUTER MODEL	AMOUNT OF RAM	TYPE OF MASS STORAGE	PRICE WITH CPU, TWO MASS STORAGE DEVICES
Victor Business Products	8088	CP/M-86; MSDOS	9000 Business Computer	128K	2-5¼" Floppies	\$5,000
Data General Corporation	Micronova	Proprietary	Enterprise 1000	64K	2-5¼" Floppies	\$7,000 w/Printer
IBM	Proprietary Design	Built Into Hardware	System 23 Data Master	64K	2-8" Floppies	\$7,500
NEC Information Systems	16-Bit Proprietary	Astra-OS	Astra 205-100	128K	2-8" Floppies	\$6,500
Pertec	T1-9900	CP/M	Pertec 1000		2-5¼" Floppies	\$6,500
Texas Instruments	TMS-9900	Proprietary	System 200 Model 220	64K	2-5¼" Floppies	\$6,250
Texas Instruments	TMS-9900	Proprietary	T1 99/4	16K	2 Minidiskettes	\$3,500
Computer Devices	6800	Basic	Miniterm 1206	64K	2-Floppies	\$3,500
Hewlett-Packard	HP-NMOS	HP 8505	HP-85	16K		\$2,750
Seattle Computer	8086	MSDOS	System 2	128K	2-8" Floppies	\$6,610 w/Terminal
Morrow Designs, Inc.	Z80	CP/M	Decsion 1	64K	1-5¼" Floppy 1-Hard Disk	\$6,500 w/Display

## APPENDIX D: QUESTIONNAIRES





USER

## I. QUALIFICATION OF RESPONDENT

1. Does your firm currently use personal computers? ☐ Yes ☐ No  
(If respondent answers no, ask questions 2 and 3 and end the interview. If yes, move to question 4.)
2. Has your firm decided against using personal computers? ☐ Yes ☐ No  
If yes; why? \_\_\_\_\_  
\_\_\_\_\_
3. Does your firm plan to evaluate the possibility of using personal computers in the future? ☐ Yes ☐ No  
If yes; for what application(s): \_\_\_\_\_  
\_\_\_\_\_

## II. PERSONAL COMPUTER HARDWARE

4. Please describe the personal computers presently installed in your (firm or department).

Manufacturer	Model	Amount of Disk Storage	Average System or Unit Cost	Number of Installations			Number of Projected Installations		User Departments
				1979	1980	1981	1982	1983	
1.									
2.									
3.									
4.									

5. Are other departments using personal computers? ☐ Yes ☐ No  
If yes; Please name them: \_\_\_\_\_  
\_\_\_\_\_

6. How are the personal computers being applied in your (firm or department)?

- a) \_\_\_\_\_  
b) \_\_\_\_\_  
c) \_\_\_\_\_

7. What additional applications are planned for the personal computer over the next two years in your (firm or department)?

- a) \_\_\_\_\_  
b) \_\_\_\_\_  
c) \_\_\_\_\_

8. Has the introduction of more powerful personal computers (i.e. IBM's Personal Computer with 16-bit CPU) changed your thinking about personal computer applications in your (firm or department)? ☐ Yes ☐ No

If yes; what applications: \_\_\_\_\_  
\_\_\_\_\_

Would you now buy a 16 bit versus an 8 bit CPU? ☐ Yes ☐ No

Your reason: \_\_\_\_\_  
\_\_\_\_\_

9. What sources have you used in evaluating personal computers in the market? (check all that apply)

- ☐ Visited a computer store: Name \_\_\_\_\_  
☐ Read trade magazines and trade journals: Name \_\_\_\_\_  
☐ Attended trade show: Name \_\_\_\_\_  
☐ Visit by a hardware salesperson: Name \_\_\_\_\_  
☐ Used EDP department as consultants: Name \_\_\_\_\_  
☐ Outside consultants: Name \_\_\_\_\_  
☐ Others \_\_\_\_\_  
\_\_\_\_\_

Which source was best and why? \_\_\_\_\_  
\_\_\_\_\_

10. What justification was used in purchasing a personal computer for your department? \_\_\_\_\_  
\_\_\_\_\_

11. Please outline the approval cycle for purchase of your department's personal computer(s).

- a) \_\_\_\_\_
- b) \_\_\_\_\_
- c) \_\_\_\_\_
- d) \_\_\_\_\_
- e) \_\_\_\_\_
- f) \_\_\_\_\_

12. From what source(s) was your (firm's or department's) personal computers purchased?

- ☐ Retail store: Name \_\_\_\_\_
- ☐ Manufacturer's sales force: Name \_\_\_\_\_
- ☐ Mail order: Name \_\_\_\_\_
- ☐ Purchased for you by your EDP department: Name \_\_\_\_\_
- ☐ Other sources: \_\_\_\_\_ Name: \_\_\_\_\_  
\_\_\_\_\_ Name: \_\_\_\_\_

13. Who installed your personal computer system(s)? (i.e. vendor, EDP Department, etc.)

Dept. or vendor name: \_\_\_\_\_

### III. FINANCIAL SECTION

14. What was your (check one) ☐ firm's or ☐ department's total EDP budget for: 1980 \$ \_\_\_\_\_ and 1981 \$ \_\_\_\_\_

15. What is your (check one) ☐ firm's or ☐ department's total EDP budget for: 1982 \$ \_\_\_\_\_ and 1983 \$ \_\_\_\_\_

16. What percent of your (check one) ☐ firm's or ☐ department's total EDP budget has been allocated to personal computer-based products and services for:

1980	1981	1982	1983
%	%	%	%

INPUT

17. What percent of the personal computer budgets has been allocated for:

Service/System	1980	1981	1982	1983
a) Personal computer hardware:	%	%	%	%
b) Applications software: (personal computers)	%	%	%	%
c) Systems software: (personal computers)	%	%	%	%
d) Professional services: (personal computers)	%	%	%	%
Total	100%	100%	100%	100%

18. From what price range will your ☐ firm or ☐ department purchase personal computers over the next three years?

- ☐ \$1,000 or less  
☐ \$1,001 to \$5,000  
☐ \$5,001 to \$10,000  
☐ \$10,001 to \$15,000  
☐ None of these

19. Is your personal computer hardware currently:

- ☐ Leased  
☐ Rented  
☐ Purchased  
☐ Combined: Note the ratio: \_\_\_\_\_

#### IV. SOFTWARE SECTION

20. Please describe the applications software currently used by your department.

Application	Vendor Name	Unit Price	Required Hardware	Number of Company Installations		Number of Projected Installations	
				1980	1981	1982	1983
1.							
2.							
3.							
4.							



21. Please describe the systems software currently used in your department

Systems Type	Vendor Name	Unit Price	Required Hardware	Number of Company Installations		Number of Projected Installations	
				1980	1981	1982	1983
1.							
2.							
3.							
4.							

22. Which additional applications will you address over the next two years with your department's personal computer(s) and who will provide the software?

Application

Source of Software

- a) \_\_\_\_\_
- b) \_\_\_\_\_
- c) \_\_\_\_\_

23. Please outline the jurisdiction of the EDP department regarding personal computer systems management in your ☐ firm or ☐ department.  
(what activities do they conduct?) \_\_\_\_\_

24. Is the role of the EDP department changing as the use of personal computers increases in your firm/department? ☐ Yes ☐ No  
If yes; how is it changing: \_\_\_\_\_

25. Which languages are you using on your personal computer systems for programming?

<input type="checkbox"/> Basic	<input type="checkbox"/> AGOL	<input type="checkbox"/> Others _____
<input type="checkbox"/> Pascal	<input type="checkbox"/> COBOL	<input type="checkbox"/> _____
<input type="checkbox"/> PL/1	<input type="checkbox"/> Assembly	<input type="checkbox"/> _____
	<input type="checkbox"/> Fortran	<input type="checkbox"/> _____

26. From what sources does your (firm or department) purchase software?

☐ Retail store: Name \_\_\_\_\_

☐ Manufacturer hardware: Name \_\_\_\_\_

☐ Mail order: Name \_\_\_\_\_

☐ Purchased for you by your EDP department: Name \_\_\_\_\_

☐ Other sources: \_\_\_\_\_ Name \_\_\_\_\_

\_\_\_\_\_ Name \_\_\_\_\_

27. What sources have you used in evaluating personal computer software on the market? (check all that apply)

☐ Visited a computer store: Name \_\_\_\_\_

☐ Read trade magazine and trade journals: Name \_\_\_\_\_

☐ Attended trade shows: Name \_\_\_\_\_

☐ Attended educational seminars: Name \_\_\_\_\_

☐ Visit by a hardware salesperson: Name \_\_\_\_\_

☐ Used EDP department as consultants: Name \_\_\_\_\_

☐ Outside consultants: Name \_\_\_\_\_

☐ Others: \_\_\_\_\_

\_\_\_\_\_

## V. HARDWARE/SOFTWARE MAINTENANCE

A.

28. Who provides hardware maintenance for your personal computer system(s)? Name of department or vendor: \_\_\_\_\_

\_\_\_\_\_

29. Is there a maintenance fee: ☐ Yes ☐ No

If yes; how much \$ \_\_\_\_\_/Month

30. Are you satisfied with the maintenance service? ☐ Yes ☐ No  
If no; why not? \_\_\_\_\_  
\_\_\_\_\_

B.

31. Who provides software maintenance for your personal computer system(s).  
Name of department or vendor \_\_\_\_\_  
\_\_\_\_\_

32. What does software maintenance entail? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

33. Is there a maintenance fee? ☐ Yes ☐ No  
If yes; how much? \$ \_\_\_\_\_/Month

34. Are you satisfied with this service? ☐ Yes ☐ No  
If no; why not? \_\_\_\_\_  
\_\_\_\_\_

If no; how will maintenance change \_\_\_\_\_  
\_\_\_\_\_

35. Is there a need for software customizing? ☐ Yes ☐ No. If yes; who  
does it? Department or vendor name: \_\_\_\_\_  
\_\_\_\_\_

36. Are you satisfied with your back-up procedures for software and  
data? ☐ Yes ☐ No If not; Why? \_\_\_\_\_  
\_\_\_\_\_

## VI. TRAINING

A.

37. Please explain the personal computer hardware training given to your department. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

B.

38. Please explain the personal computer software training given to your department? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

39. Who provided the training? Department or vendor name: \_\_\_\_\_

\_\_\_\_\_

40. Was this training adequate? ☐ Yes ☐ No. If no; explain \_\_\_\_\_

\_\_\_\_\_

41. How should this training be conducted in the future and by whom?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

42. Have you bought professional services in conjunction with your use of personal computer systems at any time? ☐ Yes ☐ No.

If yes; what did the service entail? \_\_\_\_\_

\_\_\_\_\_

43. Were you satisfied with the service? ☐ Yes ☐ No

If no; why not? \_\_\_\_\_

\_\_\_\_\_

Do you think you will need professional services in the future?

\_\_\_\_\_

\_\_\_\_\_

## VII. SUMMARY

44. To increase your (check one) ☐ firm's or ☐ department's use of personal computers over the next five years, what improvements need to be made to the following?

- a) Hardware \_\_\_\_\_  
\_\_\_\_\_
- b) Software \_\_\_\_\_  
\_\_\_\_\_
- c) Maintenance \_\_\_\_\_  
\_\_\_\_\_
- d) Support \_\_\_\_\_  
\_\_\_\_\_
- e) Training \_\_\_\_\_  
\_\_\_\_\_
- f) Communications \_\_\_\_\_  
\_\_\_\_\_
- g) Others \_\_\_\_\_ : \_\_\_\_\_  
\_\_\_\_\_

45. In your opinion how should personal computers interface with your (check one) ☐ firm's or ☐ department's operations now and in the future? \_\_\_\_\_  
\_\_\_\_\_

46. In your company, which of the following large computer systems and/or services have been or will be replaced by personal computer systems:

- |   |   |
|---|---|
| <input type="checkbox"/> Interactive time sharing | <input type="checkbox"/> In-house Data Processing |
| <input type="checkbox"/> Remote Batch             | <input type="checkbox"/> Batch                    |
| <input type="checkbox"/> Others _____             |   |

Please give reasons for replacement (if you checked any)? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



47. Briefly describe your background in computers and your academic education: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_.

THANK YOU

VENDORI. INTRODUCTION

1. Please indicate the following products and/or services currently offered by your company:

(Section II) ☐ Personal computer hardware (1)

(Section VII) ☐ Applications software for personal computers (5)

(Section VII) ☐ Systems software for personal computers (5)

(Section X) ☐ Professional services for personal computers (8)

2. Does your company plan to offer any new personal computer products and/or services this year?

☐ Yes ☐ No ☐ No Comment

Please elaborate: \_\_\_\_\_  
\_\_\_\_\_

II. PERSONAL COMPUTER HARDWARE SECTION

3. Please describe your personal computer product(s).

Product Name	Microprocessor		Retail Price	Number of U.S. Installation in:		
	Model	RAM Memory		1979	1980	1981
1.						
2.						
3.						

4. Do you offer or do you plan to offer a 16-bit microprocessor in your personal computers?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### III. FINANCIAL SECTION

5. What were the revenues from the sale of your personal computers in:

1979 \$ \_\_\_\_\_

1980 \$ \_\_\_\_\_

1981 \$ \_\_\_\_\_

6. How much revenue do you expect the sale of these personal computer(s) to generate in:

1982 \$ \_\_\_\_\_

1983 \$ \_\_\_\_\_

AAGR: \_\_\_\_\_ %

7. Please break down the cost of sales for your personal computer(s) in terms of:

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>Projected</u> <u>1983</u>
a. Advertising:	_____	_____	_____	_____
b. Sales Force:	_____	_____	_____	_____
c. Marketing:	_____	_____	_____	_____

IV. 8. Is your company offering maintenance to end-users? ☐ Yes ☐ No

a. If yes, please describe (i.e., basic agreement and cost) \_\_\_\_\_

b. If no, how are end users provided service for your hardware products? \_\_\_\_\_

## V. USER TRAINING

9. Do you provide basic computer operation training to your end-users? ☐ Yes ☐ No

a. If yes, please describe: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

- The cost? \$ \_\_\_\_\_

b. If no, reason: \_\_\_\_\_

\_\_\_\_\_

## VI. HARDWARE MARKETING

10. What kinds of distribution channels is your company using for its personal computer(s)? (check all that apply)

☐ Direct Sales Force

☐ Mail Order Catalogs

☐ Retail Computer Stores

☐ Company Computer Stores

☐ Others: \_\_\_\_\_

\_\_\_\_\_

11. Which distribution channels are most successful for you in terms of percentage of sales?

a. \_\_\_\_\_ ( ) %

b. \_\_\_\_\_ ( ) %

12. What product features are drawing customers to your personal computer(s)? \_\_\_\_\_

13. What obstacles has your company encountered from the marketplace concerning the selling of your personal computer(s)?

\_\_\_\_\_

\_\_\_\_\_

14. Who do you consider to be your competition in the sales of personal computers?

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_

15. Briefly, how do you evaluate customer needs? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

16. Which distribution channels are most successful for you in terms of percentage of sales?

- a. \_\_\_\_\_ (        ) %
- b. \_\_\_\_\_ (        ) %

17. What are the major characteristics of your major buyers?

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_
- d. \_\_\_\_\_

Is this changing? ☐ Yes ☐ No If yes, what are the changes? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



## VII. PERSONAL COMPUTER SOFTWARE

18. Please describe your applications and systems software products for personal computers.

## a. Applications Software:

Product Name	Applications Designed for	Hardware Required	Average Software Unit Price	# of U.S. Installations			Projected Installations	
				1979	1980	1981	1982	1983

## b. Systems Software:

Product Name	Systems Applications	Hardware Required	Average Software Unit Price	# of U.S. Installations			Projected Installations	
				1979	1980	1981	1982	1983

## VIII. SOFTWARE MARKETING

19. Will the introduction of 16-bit microprocessors have any effects on your software offerings? ☐ Yes ☐ No

a. If yes, what effects on application software? \_\_\_\_\_

\_\_\_\_\_

b. If no, why not? \_\_\_\_\_

\_\_\_\_\_

c. If yes, what effects on systems software? \_\_\_\_\_

\_\_\_\_\_

d. If no, why not? \_\_\_\_\_

20. Will the introduction of 16-bit microprocessors (by you or your competitors) change your company's strategy as far as who you sell your products to? ☐ Yes ☐ No

If yes, what will change? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

21. What changes have been made over the last three years (because of new technologies), regarding the selling of your personal computer products? \_\_\_\_\_  
\_\_\_\_\_

22. What kinds of distribution channels is your company using for its software products? (check all that apply)

- ☐ Direct Sales Force
- ☐ Mail Order Catalog
- ☐ Publishing Houses
- ☐ Retail Stores
- ☐ Others: \_\_\_\_\_  
\_\_\_\_\_

23. Will your current distributing methods, for software products, change over the next three years? ☐ Yes ☐ No

If yes, how? \_\_\_\_\_  
\_\_\_\_\_

24. What kinds of applications will your company be designing software for over the next three years? Break this down by:

<u>Large Corporation</u>	<u>Small Business</u>	<u>Education</u>	<u>Home</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

## IX. SOFTWARE FINANCIAL

25. What were the revenues for the sale of applications software in:

(\$ thousands)			Projected Revenues (\$ thousands)	
1979	1980	1981	1982	1983

26. What were the revenues for the sale of systems software in:

(\$ thousands)			Projected Revenues (\$ thousands)	
1979	1980	1981	1982	1983

27. What will be the ratio of unit sales for 8-bit application software vs. 16-bit by:

1982	1983	1984
8 vs. 16	8 vs. 16	8 vs. 16

28. What will be the ratio of unit sales for 8-bit systems software vs. 16-bit by:

1982	1983	1984
8 vs. 16	8 vs. 16	8 vs. 16

## X. PROFESSIONAL SERVICES

29. Does your company presently offer professional service to personal computer customers? ☐ Yes ☐ No

a. If yes, to what kinds of customers? \_\_\_\_\_

1. What services are provided? \_\_\_\_\_

2. Why is professional service important to these customers? \_\_\_\_\_

b. If no, will you offer professional service in the future?

☐ Yes ☐ No

1. If yes, when? \_\_\_\_\_

2. Why will you offer it at that time? \_\_\_\_\_

## XI. SUMMARY

30. To increase the acceptance of personal computers within your selected markets, what product changes will be needed over the next five years regarding:

a. Hardware: \_\_\_\_\_

b. Maintenance: \_\_\_\_\_

c. Support: \_\_\_\_\_

d. Software: \_\_\_\_\_

e. User Training: \_\_\_\_\_

f. Communications: \_\_\_\_\_

31. In your opinion, how will personal computers be interfacing with a company's operations (large & small) by 1986?

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32. Does your company anticipate personal computer systems replacing any of the following computer services of systems?

Vendor Replaced

- ☐ Interactive Timesharing 

---
- ☐ Remote Batch 

---
- ☐ Batch 

---
- ☐ In-house Data Processing 

---
- ☐ Others: 

---
- ☐ None 

---
- ☐ Please elaborate on the items checked off: 

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33. Can you recommend some users we could interview:

Company/Person	City	Phone Number

THANK YOU









